DOCUMENT RESUME

ED 470 957 SE 067 003

AUTHOR	Almeras, Bethe Gilbert; Heath, David
TITLE	Access Nature[TM]: 45 Fun, Hands-On Activities for Everyone!
INSTITUTION	National Wildlife Federation, Reston, VA.
SPONS AGENCY	Department of Education, Washington, DC.
ISBN	ISBN-0-945051-72-7
PUB DATE	2001-00-00
NOTE	302p.; Developed with the assistance of Easter Seals Virginia.
CONTRACT	H128J990025
AVAILABLE FROM	National Wildlife Federation, 11100 Wildlife Center Drive, Reston, VA 20190. Web site: http://www.nwf.org.
PUB TYPE	Guides - Classroom - Teacher (052)
EDRS PRICE	EDRS Price MF01 Plus Postage. PC Not Available from EDRS
DESCRIPTORS	Ecology; Elementary Secondary Education; *Habitats; Hands on Science; Outdoor Education; Plants (Botany); *Science Activities; Science Curriculum; Science Instruction
IDENTIFIERS	National Wildlife Federation

ABSTRACT

"Access Nature" is an outdoor science curriculum that focuses on habitats. This curriculum targets students ages 6-14 and aims to develop environmental awareness, environmental leadership skills, and outdoor knowledge and skills. Specific adaptations for disabled students are also considered. Contents include: (1) "Introduction to Habitats"; (2) "Sun, Soil, and Water"; (3) "Plant Life: Not Easy Being Green"; (4) "Wildlife"; (5) "Humans Make a Difference"; and (6) "Action Module: Creating Schoolyard Habitats Sites". Each of these areas include many student activities. The appendix contains resources, SOL Chart, Sensory Garden Native Plant Chart, Sighted Guide Technique, 10 Rules for Communicating with People with Disabilities, an evaluation form and a Schoolyard Habitats certification application. (YDS)

Reproductions supplied by EDRS are the best that can be made
from the original document.

45

un.

ds-on

ivities

for

yone!

TIONAL
LDLIFE
ERATION
.nwf.org

PERMISSION TO REPRODUCE AND
DISSEMINATE THIS MATERIAL IN
MICROFICHE ONLY HAS BEEN GRANTED BY

J. Stowell

TO THE EDUCATIONAL RESOURCES
INFORMATION CENTER (ERIC)

2B

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION
CENTER (ERIC)

☒ This document has been reproduced as received from the person or organization originating it.

☐ Minor changes have been made to improve reproduction quality.

● Points of view or opinions stated in this document do not necessarily represent official OERI position or policy.

National Wildlife Federation®

ACCESS NATURE™

2

BEST COPY AVAILABLE

Access Nature™

WHY INCLUSION?

In its efforts to educate and inspire all people to conserve and connect with wildlife and wild spaces, the National Wildlife Federation is pleased to offer all participants, regardless of ability, access to nature. NWF recognizes the fact that all individuals benefit from fostering a personal connection with nature. By creating this inclusive curriculum, NWF offers educators the tools to help create quality environmental education programs that will reach participants with and without disabilities.

Written by: Bethe Gilbert Almeras
and David Heath

Edited by: Sharon Katz Cooper

Designed by: Kathy Doret

Artwork by: Patricia Wynne

CREDITS:

James L. Stofan
Vice President of Education

Edward J. Hamilton
President/CEO Easter Seals Virginia

Donna Johnson
Senior Director of Educational Publications

Heather Carskaddan
Director of Community Programs

Bill Street
Director of Classroom Programs

Stephanie Stowell
Senior Manager of Educator Programs

Bethe Gilbert Almeras
Access Nature Senior Coordinator/ Inclusion Specialist

Sharon Katz Cooper
Curriculum Specialist

SPECIAL THANKS TO THE ACCESS NATURE ADVISORY BOARD FOR THEIR INVALUABLE INPUT.
Robbie Jane Carmichael, Gallaudet University, Robert Jones, Delaware Division of Fish and Wildlife, David Mizejewski, NWF, Heidi Murphy, Overbrook School for the Blind, Dorothy Salvatierra, Thomas Jefferson Elementary School, Virginia Stern and Laureen Summers, The American Association for the Advancement of Science, Kelly Trigger, Frederick Community College.

SPECIAL THANKS TO THE DEDICATED PROFESSIONALS OF OUR PILOT SITES, WITHOUT WHOM THIS PROJECT WOULD NOT HAVE BEEN POSSIBLE.
Bill Dwyer, Alexandria Department of Recreation, Parks and Cultural Activities, Kristen Nicklas, Suha Kassira, Derrick Tucker, and Roger Muntu, Pine Spring School-Aged Child Care Center, Eddie Garretson, Eddie's Club, Devin Brown and Deborah Duerk, Camp Easter Seals(VA), LeeAnn Schray and Beatriz Zuluaga, Lutheran Social Services of the National Capital Area, Holly Franz and Mary Wolf, Fairfax County Therapeutic Recreation Department, Simon Elementary School, Mary Wolf, Project Success.

A very special thanks to all the youth, teens, and family members involved in our pilot programs!

ADDITIONAL THANKS TO:
Martha Graf and the entire Orientation and Mobility staff, Maryland School for the Blind, Florence Oxley, Lady Bird Johnson Wildflower Center, Craig Tufts, Carissa Lee, Carrie Swail, Jennifer Lewis, and Stacy Carr, NWF.

© 2001 National Wildlife Federation. All rights reserved.
No part of this publication may be reproduced or transmitted in any form or by any means, electronic or mechanical, including photocopy, recording, or any information storage retrieval system, without permission in writing from National Wildlife Federation.

National Wildlife Federation does, however, grant limited permission to educators to make copies of the worksheets that are included in this book, provided that such worksheets are used for educational, non-commercial purposes. This permission does not extend to copying for promotional purposes, creating new collective works or derivative works, or resale.

NATIONAL
WILDLIFE
FEDERATION®
www.nwf.org®

NWF Executive Staff:

President & CEO
Mark Van Putten

General Counsel
Eileen Morgan Johnson

Sr. Vice President & CFO
Lawrence J. Amon

Sr. Vice President
Conservation Programs
Jamie Clark

Sr. Vice President
Constituent Programs
Natalie S. Waugh

Staff Director
Wayne Schmidt

NWF Vice Presidents:
Jessie A. Brinkley,
Dan Chu,
Robert S. Ertter,
Carole S. Fox,
Philip B. Kavits,
Jaime Berman Matyas,
Thomas F. McGuire,
James L. Stofan

Senior Advisors:
Tom Dougherty,
Douglas B. Inkley

Policy Directors:
R. Montgomery Fischer,
Susan Rieff

National Wildlife Productions:
Christopher N. Palmer
President & CEO

Past President:
Jay D. Hair

Educational materials for Access Nature are based upon work supported by the U.S. Department of Education under Grant No. H128J990025. Any opinions, findings, and recommendations expressed in this material are those of the authors and do not necessarily reflect those of the U.S. Department of Education.

This curriculum was developed with the assistance of Easter Seals Virginia.

Red Squirrel Cover
Photo by Larry West

ISBN 0-945051-72-7

BEST COPY AVAILABLE

NATIONAL
WILDLIFE
FEDERATION
www.nwf.org™

The mission of the National Wildlife Federation
is to educate, inspire and assist
individuals and organizations of diverse cultures
to conserve wildlife and other natural resources
and to protect the Earth's environment
in order to achieve
a peaceful, equitable, and sustainable future.

As America's largest member-supported
conservation group, NWF leads grassroots efforts
to safeguard wildlife, wild places and the natural resources
on which we all depend.

The National Wildlife Federation has been a leader
in environmental education for nearly 65 years.
From our Schoolyard Habitats® program and teacher workshops to
Ranger Rick™ magazine and our award-winning
television shows and films,
NWF's dynamic education efforts reach out
to help people discover, experience and connect
with the wild in our world.

For more about NWF's education programs,
turn to the back page of this book.
We also hope you will visit us at www.nwf.org.

BEST COPY AVAILABLE

Table of Contents

Table of Contents

Introduction

8 What is Access Nature?
8 Who Should Use This Curriculum?
8 Curriculum Overview
9 Activity Design
9 Disabilities & Adaptations
16 Tips for Teaching in the Outdoors
17 Field Trips & Safety Considerations
18 Role Models & Mentors
21 Habitat Background

Section 1: Introduction to Habitats

34 HAVE TO HAVE A HABITAT
Defining "habitat" and exploring some examples hands-on.

38 HABITAT WEB
A web of connections among living and non-living things.

57 DESIGNING WILDLIFE HABITATS
Creating a hands-on model of a habitat.

61 NATURE SCAVENGER HUNT
A search for interesting natural objects in a familiar place.

65 HABITATS FOR SALE
Participants write classified ads for animal habitats.

68 WILDLIFE OBSERVATION HIKE
Participants hone their observation skills outside.

Section 2: Sun, Soil & Water

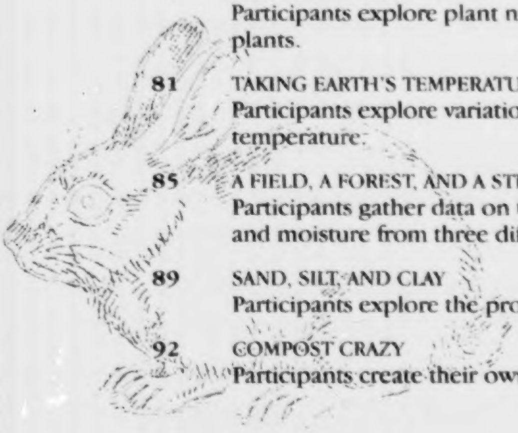
74 PHOTOSYNTHESIS PHUN
Participants explore plant needs with live plants.

81 TAKING EARTH'S TEMPERATURE
Participants explore variations in temperature.

85 A FIELD, A FOREST, AND A STREAM
Participants gather data on temperature and moisture from three different habitats.

89 SAND, SILT, AND CLAY
Participants explore the properties of soil.

92 COMPOST CRAZY
Participants create their own compost bin.



97 MAKING A MODEL STREAMBED
Participants simulate the effects of water over time on a streambed.

100 THE WATER CYCLE
Participants observe how water is continuously cycled between land and water formations and the atmosphere.

106 WATER, WATER, EVERYWHERE?
Participants explore the availability of water for human use.

112 THE WATERSHED WHERE YOU LIVE
Participants explore the definition of a watershed and identify the one in which they live.

Section 3: Plant Life: Not Easy Being Green

120 BUILD A TREE
Participants learn about tree parts by building a human tree.

126 TREE DETECTIVES!
Participants practice observation skills and apply them to identifying trees in their neighborhood.

133 FLOWER POWER
Participants dissect a flower to examine its parts closely.

137 BUILD YOUR OWN FLOWER
Participants design their own flowers for attracting certain pollinators, using art materials.

141 FLOWER HUNT
Participants go on a scavenger hunt to find different kinds of flowers.

Section 4: Wildlife

146 ACTING LIKE ANIMALS
An animal charades game.

151 AN UNNATURAL TRAIL
A hike to explore camouflage.

154 ANIMAL HOMES HIKE
Discovering different animal homes and how they are built.

159 LOCAL WILDLIFE
Participants discover how local wildlife fit into their area.

Table of Contents

166 HABITAT HUNT
A search to find important habitat elements for various animals.

170 WOODLAND CHASE
Participants experience the predator/prey relationship with a fun outdoor activity.

174 BIRD BEHAVIOR HIKE
Participants head outside and observe different bird behaviors.

179 BUILDING BIRDHOUSES AND FEEDERS
Instructions on how to build simple birdhouses and bird feeders.

184 SPIDER SENSATIONS
Participants discover how web-spinning spiders find their prey by feel.

188 SMALL SEEK
Participants investigate the world of decomposers first-hand.

Section 5: Humans Make a Difference

194 STOP! EROSION!
Participants explore the behavior of water and soil erosion, and devise a small project to attempt to stop soil erosion.

200 DEADLY LINKS
Participants play a game to learn about the effects of pesticides.

203 HABITAT SHRINK
Participants play a game demonstrating the effects of habitat loss on animal populations.

208 WHAT TO DO WITH AN EMPTY LOT
Participants take part in a role play to determine the use of vacant land.

216 CAREER DAY
Participants explore different environmental-related careers through role playing.

221 ASK THE EXPERT
Participants hear a guest speaker involved in an environmental career and have the chance to ask questions.

224 PLEDGE OF ACTION
Participants create a pledge to carry out an environmentally-friendly action.

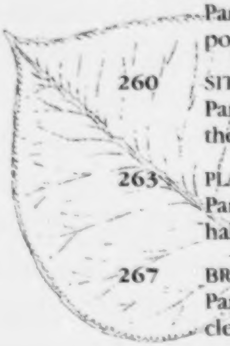
Section 6: Action Module: Creating Schoolyard Habitats® Sites

228 Introduction
228 Background
230 Planning
231 Creating the Habitat Team
234 Setting the Goals
237 Next Steps
239 Accessibility Guidelines

242 ACTIVITIES

242 SITE MAPPING
Participants take inventory of their potential habitat site.

257 DREAM HABITAT
Participants take time to imagine the possibilities of their habitat project.



260 SITE DESIGN
Participants create a site plan for their habitat project.

263 PLANT SELECTION
Participants select plants for their habitat project.

267 BREAKING NEW GROUND
Participants begin the project by clearing and preparing the ground.

271 PLANTING YOUR WILDLIFE HABITAT SITE
Participants plant their selected vegetation on the habitat site.

274 CREATING A HABITAT CARE GUIDE
Participants create a guide for on-going care and maintenance of their habitat site.

277 CREATING A HABITAT FIELD GUIDE
Participants create a field guide for other users of their habitat.

Appendices

282 Resources
292 SOL Chart
294 Sensory Garden Native Plant Chart
296 Sighted Guide Technique
298 10 Rules For Communicating With People With Disabilities
299 Evaluation Form
300 Schoolyard Habitats Certification Application

Introduction

Introduction

What is Access Nature?

Access Nature is an inclusive outdoor education curriculum focused on the theme of habitat. As educators, it is important to include all participants, regardless of ability level, in the learning experience. Each of the activities in this sixty-hour curriculum is aimed at youth and teens ages 6-14 (and Action Module activities through age 18), and contains specific adaptations for participants with four categories of disabilities: hearing, learning/cognitive, motor, and visual.

By engaging in Access Nature's hands-on activities, participants will:

- Build outdoor knowledge and skills;
- Increase environmental awareness and confidence; and
- Develop environmental leadership abilities through a conservation project.

Who Should Use This Curriculum?

Access Nature is a non-formal curriculum, designed for anyone working with youth or teens interested in the environment. Camp counselors, after-school professionals, nature center staff, therapeutic recreation specialists, and many other professionals will find this curriculum useful. However, formal educators will also find these activities easy to use. To facilitate classroom use, we have included a chart showing the alignment of each activity with the National Science Education Standards.

The Access Nature curriculum can be used as a whole to create a comprehensive habitat-based program or as a supplement to other materials you may be using. It is important to note that the adaptations in Access Nature make the activities appropriate for any audience. Whether you have thirty children with disabilities in a group, one child with a disability, or no children with disabilities in your group, you will find these activities engaging, educational, and fun. This curriculum offers all participants access to nature!

Curriculum Overview:

The curriculum is divided into six sections: Introduction to Habitats; Sun, Soil & Water; Plant Life: Not Easy Being Green; Wildlife; Humans Make a Difference; and the Action Module. The design of the curriculum is progressive—beginning with a holistic overview of ecosystems and habitat, moving on to specific components of habitat in the subsequent sections, then exploring human impact on habitats. The Action Module section combines all the skills and knowledge gained throughout the curriculum in the creation of a habitat-based conservation project. Such a design allows participants to progress from developing basic habitat knowledge to gaining a sense of environmental responsibility, empowerment, and action.

Each section contains hands-on activities with broad objectives that develop skills in different areas including:

- environmental and biological sciences
- observation and data collection
- planning
- organizing
- decision-making
- environmental stewardship
- language arts
- creative arts
- leadership

Introduction

Activity Design:

Each activity is presented in an easy to follow format.

Summary: Gives the basic focus of the activity.

Time: The time required to complete each activity.

Grade Level: Gives the most appropriate level of participants for this activity. Most lessons also provide suggestions for modifying the activity for older and/or younger participants. You will need to use your judgement to assess the abilities and interests of your participants for a given activity.

Learning Objectives: A statement of what each activity will teach participants.

Materials Needed: A list of all necessary materials and equipment.

Background: A brief introduction to the theme of each activity, including key terms and concepts required to teach the activity.

What to Do: Detailed instructions for activity set-up/implementation.

Questions: To ask participants before, during, and after the activity to spark their thinking.

Adaptations: Suggested adaptations for each of the disability categories.

Disabilities and Adaptations:

There are as many kinds of disabilities as there are people, and each is unique to its individual. In this manual, Access Nature provides adaptations for each activity for four major categories of disabilities: motor, learning/cognitive, hearing, and visual. In terms of adaptations, Access Nature aims to: 1) present information in a practical format that enables all children and teens to participate in the curriculum's activities or alternatives, and 2) provide information and ideas for instructors that enable them to confidently and comfortably engage all participants.

The adaptations are general enough to target a broad base of people with disabilities and should not be viewed as a definitive list of accommodations available to instructors. As with all of us, children and teens with disabilities are individuals with a variety of strengths, needs, interests, and learning styles.

Not all participants with disabilities will need adaptations. Modifications should be made on an individual, as-needed basis and should encourage as much independence as possible. This basic premise should be your guide when adapting activities. When possible, individualize adaptations to meet individual participant's needs and always focus on individual strengths and abilities.

Planning Activities:

In the initial stages of planning, it may be helpful to involve parents or other instructors when possible. Try to incorporate adaptations/techniques that are used at home or at school into your program. More often than not, adaptations are transferable from one learning setting/situation to another and many tools or strategies used in the participants' homes or classrooms can be applied to the outdoors. Request that participants bring any adaptive equipment they might utilize regularly (e.g., a reacher, assistive listening device, or communication board) to ensure the fullest level of participation. This exchange of information can be accomplished in a variety of ways, such as requesting information up-front on a registration form, having an orientation meeting prior to the program's starting, or meeting with parents informally on the first day of activities.

Preparing Yourself:

What preparation should you as the instructor or facilitator do before embarking on one of these lessons? Below are a few general guidelines:

1. Read over the lesson and the adaptations that pertain to your group carefully.

2. Evaluate what materials and special equipment you will need for this lesson and your particular group. Always be sure to have a couple of extras if possible.

3. Discuss in detail the lesson and any modifications you are making to it with your aides. Be sure everyone knows their role in running the lesson and who to ask if they encounter any challenges.

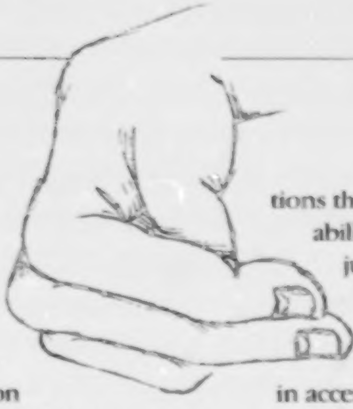
4. Be flexible. Not everything will run exactly as you planned it. Be ready to modify as you go. Be creative and open for suggestions. Don't be afraid of the trial and error process. Remember that not everything works for every person. What matters is that you are willing to try and try again until you reach the end result, which is to have each participant exploring and experiencing nature to the best of his/her individual abilities.

Talking About Disabilities:

Just as any tool can be powerful in a positive or negative way, language can either work to your advantage or it can result in negative effects. Without awareness of appropriate language, a person may inadvertently offend a person or convey a message they did not intend.

A person with a disability is a person first. Referring to a person by a disability, for example "an epileptic" or "the deaf teacher," is inappropriate. Instead use "a person who has epilepsy" or "a teacher who is deaf." First and foremost they are people,

Introduction



secondly, they may have a disability. People with disabilities prefer to be called just that, people with disabilities. Mention a person's disability only if it is relevant to the issue. If it is not relevant, why mention it? Use common sense, but let common sense be guided by an awareness of sensitive terminology.

Disability Categories:

Access Nature addresses four broad disability categories. Some disabilities may affect only one category or all four. It is also important to note that some individuals may have a combination of disabilities and that adaptations will need to be considered for each of these. The following is a brief overview of the disability categories used in Access Nature.

1. Hearing Disabilities: Hearing impairments may result from problems in any part of the ear or the hearing center of the brain. Hearing loss is categorized as mild, moderate, severe, or profound. Individuals who are deaf or hard of hearing will use different method(s) of communication and/or communication equipment including manual (sign language), oral (speech/lip reading), and/or assistive listening devices. In addition to individuals who are deaf or hard of hearing, some conditions that may result in hearing loss include brain injury, Cerebral Palsy (CP), and cleft palate and cleft lip. Adaptations address issues in communication, information presentation, and safety.

2. Learning/Cognitive Disabilities: This is a broad category that focuses on the perception and processing of information and/or level of developmental functioning. Many learning/cognitive disabilities are not readily noticed, but can become apparent during the learning process. A person with a learning or cognitive disability may have one or more associated conditions, including Attention Deficit Disorder (ADD), Dyslexia, Autism, Cerebral Palsy (CP), Down Syndrome, or other forms of Mental Retardation (MR). Adaptations address issues in information presentation, decreasing over-stimulation, and materials.

3. Motor Disabilities: This category represents physical disabilities related to the motor function of either the upper or lower extremities, or both. Some individuals with motor disabilities may require assistive mobility devices such as wheelchairs, walkers, or canes. Other individuals may require adaptive equipment such as tabletop scissors or tools with built up handles to complete activities, while others may require no assistance at all. Conditions that may result in motor disabilities include spinal cord injury, Multiple Sclerosis (MS), Muscular Dystrophy (MD), and Cerebral Palsy (CP). Adaptations address issues in accessibility and materials.

4. Visual Disabilities: Individuals with visual disabilities possess varying levels of sight. Many individuals can perceive some degree of light and detect motion around them. Others can see blurs of images or bright colors. Ask individuals with a visual impairment what he/she can see and how best to present information to him/her. It is important to note that not all individuals who are blind know Braille. Visual impairments or blindness are divided into two major categories, Total Blindness and Low Vision. Adaptations address issues in information presentation, materials, and orientation.

General Activity Adaptations:

While each activity in this manual contains specific adaptations, certain adaptations are general rules of thumb for presenting information to individuals with certain corresponding disabilities. Below are common adaptations and suggestions for each disability category. Be sure to become familiar with these and incorporate them into each activity, reviewing as needed.

See individual activities for specific adaptations for that activity.

1. ***Hearing Disabilities:*** For participants with hearing disabilities, the most common adaptations relate to communication. Each of the suggestions below are designed to facilitate the most effective two-way communication possible.

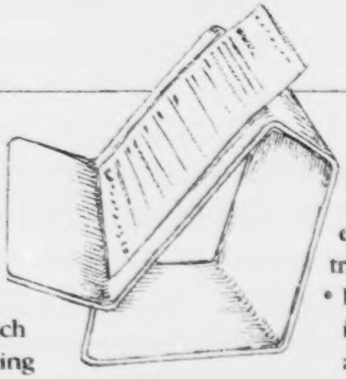
- Use a sign language interpreter. Give the interpreter a copy of the activity with key words and concepts highlighted before the session. Check with local colleges and organizations for people who are deaf or hard of hearing, or social service agencies to find sign language interpreters in your area. You can also ask a parent to be an interpreter. Provide the interpreter information ahead of time so he/she can be fully prepared. Remember that environmental concepts are not necessarily common signs; the interpreter will need time to prepare.
- Always face participants with hearing impairments when speaking to accommodate lip readers. Make sure to keep all objects away from your mouth when speaking; do not exaggerate mouth movements.
- Work with the interpreter to learn common signs to use during the program such as "stop," "good job," etc.
- Provide directions in writing. (Allows participants to independently check if they are on the right track.)
- Seat participants who are deaf or hard of hearing near the front of the group in a semi-circle formation.
- Position yourself and the interpreter so the participants can see you.

- Use pictures, examples, and hands- on interactions to help illustrate your points. Incorporate visual learning into sessions whenever possible.
- Check for understanding when presenting new concepts or ideas.
- When outside, have a check-in point and time for safety purposes.
- Use a flag or hand signal to interrupt or end an activity.
- Provide a note-taker, when possible. (Allows participants to focus on the instructor and interpreter.)
- Encourage participants to be active in all discussions and ask questions. Have participants raise their hands to ask or answer questions. Check with each participant to see if they are most comfortable interacting with the group by speaking, using the sign language interpreter, or writing things down.
- Plan for extra time as needed. This will give the interpreter and participants ample time to communicate.
- Reinforce positive behavior and provide encouragement.
- Maintain good eye contact. Check-in with participants throughout the activity to see if they have any questions.

2. ***Learning/Cognitive Disabilities:***

- Present information in a clear, concise manner. Avoid using too many words to present concepts; simplify. Make sure the pace is

Introduction

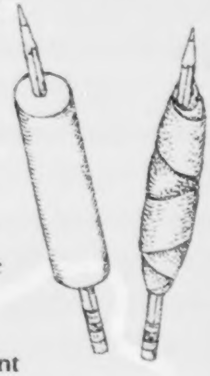


appropriate and that the vocabulary used is on the participants' level of comprehension.

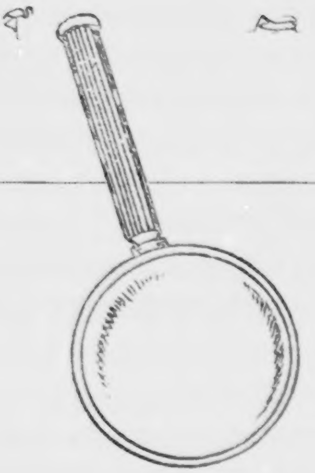
- Break activities down into steps. By doing so, you will not overwhelm participants; activities will be more manageable.
- Minimize distractions in classroom/setting to decrease over-stimulation.
- Plan for extra time as needed. This can mean a few minutes or several sessions. Some activities may require two or three sessions for individuals to complete based on their ability level. Allow time when waiting for participants to respond orally.
- Use pictures, examples, and hands-on interactions to help illustrate your points and explain directions. Incorporate visual learning into sessions whenever possible.
- Check for understanding when presenting new concepts or ideas and when giving directions.
- For written word assignments, use pictures and a few basic words for participants who have difficulty reading, or read on a lower level. Allow participants to respond by drawing when appropriate. If possible, provide small tape recorders for participants to record information.
- Have resources available that match participants' reading level; use picture books as appropriate.
- Use repetition. (Many individuals have trouble retaining information or learning it after only hearing it once.)
- Allow for questions and answers as you go.
- Encourage participants to be active in all discussions and ask questions. Let them know you are interested and value their input and participation.
- Pair up participants to complete the work as needed. Some participants will require a partner only occasionally to complete an activity successfully, others for each activity. This partner can be a peer, staff, or volunteer. Encourage the partner to ask the participant how to be of assistance and to allow the participants as much independence as possible.
- Allow for structured breaks. (This lessens over-stimulation and frustration.)
- Allow participants to stand or move around part of the time. (This provides an outlet for excess energy and reduces frustration.)
- Reinforce positive behavior and provide encouragement.

3. Motor Disabilities:

- Seat participants who use wheelchairs so that they can easily see the facilitator and any pictures or examples.
- Adjust the height and angle of the work surface as needed. (Examples: Use a reading stand or a stack of books, etc. to raise materials to the level participants need. Some participants may have adaptive equipment that they already use to accomplish this.)



- For participants with limited muscle strength or coordination of the hands, build up the handle of pencils/markers/paint brushes with foam, putty, tape, or bandage material as needed. (The individual will determine the thickness of the material. Some participants may have pencils or pens already adapted. Others may have cuffs, straps, or other assistive devices that enable them to hold traditional items.) Use large crayons for younger participants. Use large glue sticks instead of bottled glue.



Provide adaptive scissors.

- Secure items to the work surface for individuals who have spasticity or poor muscle control to prevent spills, etc. (Examples: Taping a worksheet to the desk; using a clipboard to hold a worksheet; securing a cup to a work surface with putty/clay.)

- Encourage participants to use any adaptive equipment necessary for them to fully participate in all activities. If you do not know how a particular device works, have the participant or a parent demonstrate how it works.

- Pair up participants to complete activities as needed. Some participants will require a partner only occasionally to complete an activity successfully, others for each activity. Instruct partners on how to assist participants with motor-related disabilities as needed (e.g., cueing for safety, getting around barriers, etc.). This partner can be a peer, staff, or volunteer. Encourage the partner to ask the participant how to be of assistance and to allow participants as much independence as possible.

- Choose a largely accessible site for all activities (i.e., as level as possible, does not flood, has a minimal number of obstacles, etc.). Of course, this is only possible within reason. Not every outdoor site will be completely accessible. Stake out the area before the group arrives to map out any safety concerns, obstacles, etc.

- Check with participants with ambulatory-related disabilities and/or any condition (such as a heart condition) that may affect stamina or endurance before planing any hikes. Alter the distance and/or length or time for hike-based activities as needed. Be sure to take appropriate rest breaks.

- Plan for extra time as needed.

4. Visual Disabilities:

- Give verbal directions very clearly before starting. Give clear orientation directions during all activities. Examples include "the object is one foot in front of you," "to your right," or "the ground is bumpy for the next 10 feet." Use sound cues such as tapping on a railing to help orient participants. Many individuals are comfortable with cardinal directions (North, South, East, West) but it is important to ask participants what type of directions work best for them.

- Use hands-on, concrete examples as much as possible to help illustrate points. Allow participants time to touch and explore these examples. Incorporate items that can be heard and smelled whenever possible.

- Minimize distractions in room or setting to decrease overstimulation.

- Check for understanding when presenting new concepts or ideas.

- Have a variety of magnifiers available for participants with low vision. (Many participants will have their own.) There are a variety of sizes, styles, and strengths available, from 2x up. Magnifiers are available in illuminated and non-illuminated forms.

- Provide thick, black markers for participants with low vision to use during activities.

- Have resource materials available in alternative formats, if possible (e.g., Braille, large print, and/or audio cassette).

- Consider individual lighting needs. Some individuals require brightly lit areas, while others are light sensitive. Talk to participants and see what best meets their needs. For participants who need an area brightly lit, use a lamp to illuminate the work surface. If possible, point the light at the item to be illuminated.

Introduction

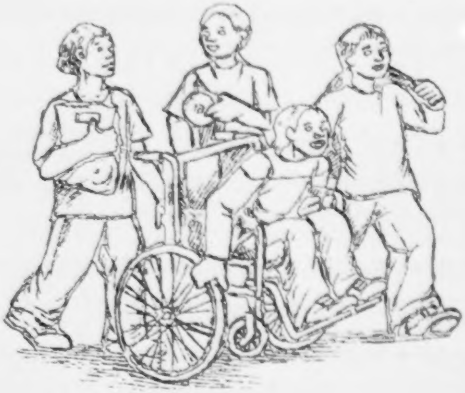
- Use activity materials that provide color contrast for participants with low vision. For example, use a large piece of black paper under a smaller piece of white drawing paper so participants can see the edges of the paper they are working on; paint or tape the handles of gardening tools a color such as yellow to contrast with soil and grass.

- Keep the discussion lively and interactive; use vivid descriptions and narrate the actions of an activity as it progresses. Involve participants as much as possible, both indoors and outdoors. Describe any sounds they may hear and items they can smell. Use descriptive words such as "fluffy," "rough," and "smooth" to describe items.

- Encourage participants to touch as many items as possible. Do not force a participant to touch an item if he or she does not want to. Fully describe the item before encouraging the participant to touch it.

- Create a large print version of any worksheets or materials for participants with low vision. Use large (at least an 18 point font) thick, block-style black letters on white paper. Enlarge all photographs. Keep worksheets simple and uncluttered. It may be necessary to spread information over two or three pages.

- Create a Braille version of any worksheets or materials for participants who are blind. (Check with local school systems, libraries, organizations, or parents to obtain a Braille writer, computer program, and/or label maker, or individuals who will translate items into Braille for you.)



- Create enlarged maps that are outlined in both thick black lines and raised lines of glue or yarn for participants to feel. Maps need to be simple and cover a small area; it may be necessary to make a series of maps to display large areas.

- Make tactile diagrams or other instructional displays out of different fabrics (e.g., felt, corduroy, satin) or items (e.g., rice, beans) to further engage participants. Label the diagrams in Braille. Create a line to connect each label to its corresponding piece with thick lines of glue or strips of yarn.

- Allow participants to make items out of different materials (e.g., clay, cotton balls, craft sticks) instead of making a drawing. Make each project as tactilely stimulating as possible.

- Pair participants up as needed. Have the partner give verbal directions or coach throughout the activity. Examples of assistive techniques include: giving verbal warnings about obstacles, providing clear directions while on the trail, not rushing, etc. Encourage partners to ask participants how to be of assistance. If possible, provide sighted guide training to individuals prior to starting the program (see appendix for tips). Contact a local school system or service agency for individuals who are blind or have low vision to locate an Orientation and Mobility Specialist to provide training.

- When outside, give each participant and his/her partner adequate space to explore. Space out starting times. Mark off the trail or area to be used with a guide string.

- Encourage participants to use any adaptive equipment necessary, including writing equipment, for them to fully participate in all activities. Provide small tape recorders for participants to record information as needed.

- Let participants know when they are doing a good job and that you value their input; encourage their efforts.

- Plan for extra time as needed.

Tips for Teaching in the Outdoors:

What are important components for successful outdoor learning experiences with children? Below are 12 general principles of action that can be applied to either ten-minute field trips or week-long residential outdoor education programs. Take a few moments to read over them before your program begins.

1. **Be purposeful:** *Have you established why you're doing what you're doing?* Ideally, reach your answers by mutual involvement of instructors and participants. Goals can be educational, social, and attitudinal, with equal importance attached to all three.

2. **Begin where you are:** Assess past and present experience of instructors and participants to promote growth and maturity for all involved. Getting children outdoors early in the year helps foster a "freedom with responsible learning" attitude so that extended trips can be embarked upon later.

3. **Do more with less:** Equipment is useful in attaining your environmental objectives, but it is a means to an end, rather than an end in itself. Take the ordinary and make it special. Awareness leads to skills, skills to competence in the outdoors.

4. **Use the discovery method:** Questions have equal priority with the "right" answers. Often answering a question with another question encourages further discovery.

SCHOOL BUS
STOP
SCHOOL BUS

5. **Use the here and now:** The "here" can be the classroom and schoolyard. Its closeness and convenience help create more confidence and skills in the instructor. The "now" is the season with its unique and special happenings (i.e., seasonal changes, current events).

6. **Take advantage of teachable moments:** The outdoors is a creator of many special events. As an instructor, facilitate an explanation of these events rather than providing the whole interpretation. When and where one teaches are just as important as what one teaches.

7. **Actively engage students:** Involvement leads to commitment. Participants need a significant say in what they are doing. It then becomes "our" program. When participants play an essential part in decision-making, they feel and give a commitment to the success of the program.

8. **Foster an environmental ethic:** *How can we educate learners to minimize their impact and maximize their reverence for life, to be a contributor, not a conqueror?* Short, repeated learning experiences in the outdoors are a good starting point. Instructor actions and attitudes should model the ideas being presented.

Introduction

9. **Have fun:** We learn best when we enjoy what we're doing. Interest and self-directed behavior come when fun is an important part of learning.

10. **Welcome serendipity:** Happy moments in finding nature's gifts not sought for are memorable and rewarding.

11. **Acquire resources:** Capital resources of the community need to be assessed and utilized to their full potential. *But what of the human resources?* Participant sharing, instructor talents, and parent promotion yield enthusiasm and immeasurable support.

12. **Make time for evaluation:** As important as pre-planning and participation is the feedback from internal and external sources. Change, improvement, and growth are results of effective evaluation.

Based on The Essential Dozen, Hugh Phillips, Taft Campus Newsletter, February 1977, Vol 1(2).

Field Trips & Safety Considerations:

General Field Trip Tips:

- When outside, be aware of the direction of the sun, especially when conducting a group discussion. It is much better if the leader is looking into the sun than participants. The direction of the sun may also be vital for participants to orient themselves, especially if they are away from the group for an extended amount of time.
- Minimize unnecessary distractions. For example, if they are mowing the lawn at your facility, move the group to another part of the property where it is quiet and participants can concentrate on the task at hand.
- Before any field trip, discuss appropriate behavior, what activities will be accomplished and any logistics.
- Bring all materials and equipment necessary for activities, snacks, first aid and safety. Include sunscreen and water in your supplies.
- Learn with the participants. Leaders can put together a great field trip without being a walking encyclopedia of facts. It is, in fact, great for participants to see you modeling the learning process.
- Increase the success of this experience by partnering with parents, community volunteers or older teens, and involving them as mentors.

Field Trip Safety Tips:

- Before any field trip, find out about and be aware of any allergies, medications, and special precautions required for the safe involvement of all participants.
- Youth and teens are safer with adequate supervision. Depending on the age of the audience, a minimum of 1 adult to 8-10 participants is recommended. For a youth audience, the recommended ratios are 1:6 for children 6-8 years of age. Depending on the needs of participants with disabilities, a smaller ratio may be required, such as 1:4 or smaller. Some individuals may need 1:1 supervision.
- When bees or wasps approach, encourage calmness and little or no movement. Usually, when bees and wasps find out that the sweet-smelling person they landed on is not a flower, they will move on. When people swat at them, on the other hand, they will often attack.
- Encourage long pants or bug repellent in areas where ticks are abundant.
- Watch out for poison ivy, poison oak, poison sumac, stinging nettles, or any other poisonous or thorny plants. Be aware of what they look like and where they grow. Use a field guide and familiarize yourself and the participants with any of these plants.

Respect Wildlife:

- Emphasize respect for all living

things, plants, animals, and fungi alike. Look, learn and leave alone.

- Model respect. Youth and teens often follow the actions of their leaders.

- If participants explore an area by turning over rocks or logs, make sure they do so carefully. In areas where venomous snakes may live, participants and leaders should always turn a rock or log over towards themselves, grasping the edge of the rock or log furthest from where they are standing. That way any alarmed creatures can escape in the opposite direction.

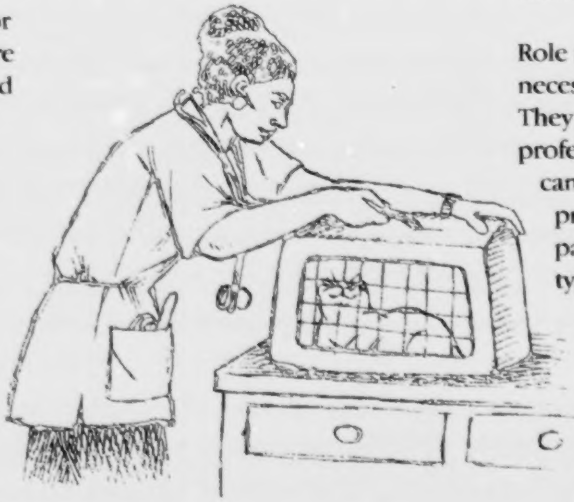
- Always return pieces of the natural world (e.g., rocks or sticks) to the place where they were found.

- If the group explores an area in middle summer to early fall, when yellow jacket colonies are especially aggressive, spend a minute or two watching for any wasps that are moving directly to and from the same place in the ground. Stay far away from this nest hole; wasps give no warning before launching a painful attack.

- Keep plants and wildlife habitats intact by staying on trails.

- Before collecting any materials from a site, obtain permission from the person or organization who owns the land. Materials from state or national parks must stay where they are found.

- Leave rare or endangered plant species alone. Consider contacting the Department of Natural Resources of the state in question, or a local office of the U.S. Forest Service, for a description of local rare or endangered plants.



- To model respect for all life, keep plants intact. Most investigation of living plants can be done with leaves, bark, flowers, etc. that remain attached or with parts that have already fallen to the ground. If plant parts are removed, strictly adhere to the "1-in -20 rule"; if there are 20 common plants in the area, one may be disturbed.

Role Models & Mentors:

Role models and mentors come in all shapes and sizes, including professionals, participants, or interested citizens from the community. Regardless of how they are incorporated into an outdoor education program, they offer a level of knowledge and support that will enhance the program and participants' enjoyment. When possible, include role models and mentors with disabilities in the program.

Role models and mentors are not necessarily one and the same. They represent different ways that professionals and volunteers can specifically interact with your programs and program participants. Below are several prototypes of how role models and/or mentors can participate in a program:

Environmental Role Model: A professional who can offer experience and/or guidance in a specific area such as botany, wildlife, or other environmental science field. In addition to a valuable level of expertise, these individuals will present career options in the field of nature/science. We strongly recommend using role models in your program. Most often you will find role models can effectively participate as guest speakers or activity facilitators.

Introduction

Mentor as a Guide: An individual with an affinity for the outdoors who shares his/her experience and time with the group. A guide can help small groups of participants move from activity to activity, assist them with participating in activities, and ask questions and give feedback to further enhance participants' level of learning.

Mentor as a Buddy: An individual who is paired with a participant and shares in the activities. This can be a participant, peer, or family member. For some individuals with disabilities, a "buddy" can aid a participant by assisting the individual as needed to complete activities.

Recruiting Role Models & Mentors:

There are many options for recruiting role models and/or mentors for your program. Role models can typically be found within local businesses, government agencies, volunteer groups or professional organizations that focus on wildlife, nature, and environmental topics (e.g., local parks, nature centers, environmental engineering firms). You may be able to find mentors at these organizations as well as within faith-based or youth-serving organizations, as well as volunteer bureaus, colleges or universities with environment-related departments and/or education programs. High schools have environmental or service clubs that volunteer many hours in their communities. Also, some schools now have community service requirements and are good sources for recruiting mentors.

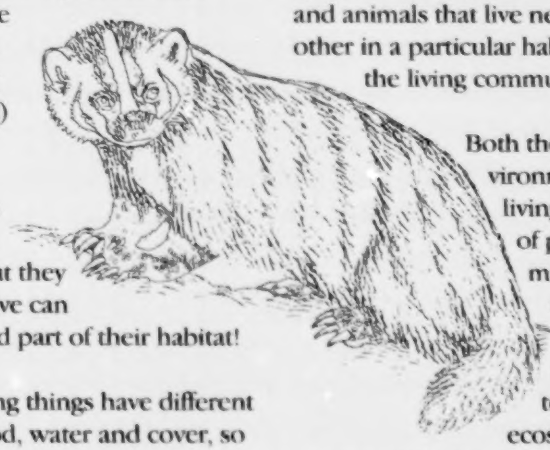
Whether you invite role models to speak at your program or recruit mentors to spend time one-on-one with participants, everyone should be briefed on his/her responsibilities and the program schedule prior to the day of the program(s). Holding a meeting to familiarize volunteers with their role and the logistics of the program is vital. Make sure that you include any necessary disability-related information, safety instructions, and other important information in the role model/mentor briefing.

Habitat Background

Habitat Background

What is a Habitat?

Habitat is a place where organisms get what they need to survive: food, water, cover and a place to raise young. In other words, a habitat is a plant or animal's home. A person's habitat might stretch from their house (where there is water, cover and a place to raise young), to the supermarket (where he or she gets food) and to the workplace. All the places people must go to get what they need to survive can be considered part of their habitat!



Different living things have different needs for food, water and cover, so each kind of animal or plant has a specific kind of habitat. For example, some sea stars live in rocky tidal pools along the Pacific coast. The rocky tidal zone forms the main part of the sea star's habitat (sea star larvae float through coastal waters, which is also considered part of the animal's habitat). A moose, on the other hand, has very different needs from a sea star and lives in a very different kind of habitat—like the evergreen forests of Alaska, among other places.

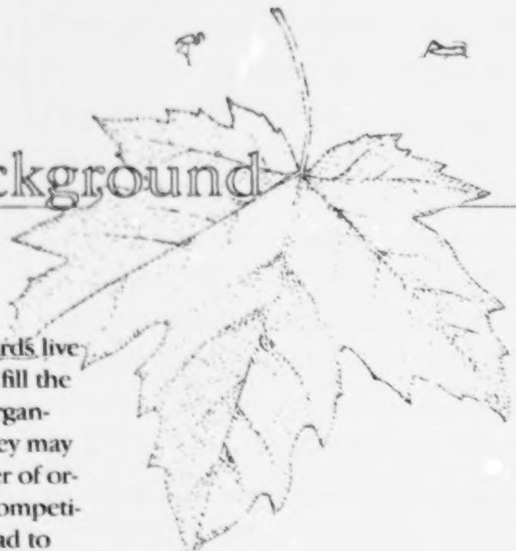
Scientists who study how an area's physical environment and living things interact are called ecologists ("eco" is derived from the Greek "oikos" meaning home). They divide their studies by scale, from smallest to largest. The smallest unit ecologists study is an individual organism, including its habitat and niche. Ecologists may also study a population of organisms of the same species. The populations of plants and animals that live near each other in a particular habitat make up the living community.

Both the physical environment and the living community of plants, animals and other organisms determine an ecosystem. Each ecosystem has a characteristic physical environment, including its climate and altitude, which produces a dominant type of vegetation. For example, eastern temperate forests tend to have cold winters and wet, hot summers. Broadleaf trees like oak and maple live well in these conditions and, in fact, most Eastern forests are defined by the mix of oak, maple, birch and other trees that grow there. These trees create a canopy that shades the forest floor and provides habitat for many creatures, such as gray squirrels, white-footed mice, white-tailed deer, blue jays and more. Desert ecosystems, on the other hand, receive little rain throughout the year and can only support plants able to tolerate dry conditions such as cacti and sagebrush, which in turn characterize the habitat for many other plants and animals.

In forests and all other ecosystems, plants and animals living there are adapted to their environment (they have inherited characteristics that enable them to survive there). Most plant and animal species have one kind of habitat that suits them best, although they may be able to find elements of habitat in many different areas. For example, some sea urchins live in kelp forests, but also can be found in rocky tide pools. Other living things have very specific requirements for their habitat. Chalcid wasps for example, are a group of insects so adapted to fig trees and vice-versa that neither can survive without the other. The wasps feed and reproduce in certain species of fig trees and these fig trees depend on the wasps as the only insects that can pollinate them. Neither can survive without the other.

Even when two organisms (any kind of living thing) have very similar habitats, their needs and how they meet these needs may be distinct, allowing them to live in close proximity to each other without close competition. Two birds, for instance, might live in the same tree but eat different foods, have different predators and have different

Habitat Background



tolerances to sunlight. The birds live in the same place, but do not fill the same role, called a niche. If organisms share the same niche, they may compete and limit the number of organisms that can live there. Competition, over a long time, may lead to greater animal and plant diversity as organisms carve out distinct niches.

North American Ecosystems:

Travelling across the United States from coast to coast, you would pass through a surprising variety of North American ecosystems, containing countless habitats for wildlife. The journey would lead you through California's chaparral and the sands of the Mojave Desert, on to the evergreen forests of the Rocky Mountains, the mid-western prairies and finally arriving at the broadleaf forests of the East Coast. All of these ecosystems contain a wide array of plant communities and physical environments, and thus support a great diversity of wildlife habitat.

Although we rarely think of urban areas as "wild places," cities are parts of various ecosystems, too. Rare and delicate ecosystems may sometimes be found alongside an abandoned railroad track, under the roaring jet engines of an airport, and in between city blocks. In the city, a park may be a squirrel's habitat, where it finds acorns to eat, water to drink and a hole in a tree to hide and raise its young. Across town, a skyscraper may provide a nesting place for a peregrine falcon, while the park may provide it with food and water.

What Creates This Diversity in Habitats?

The diversity results from unique combinations of the physical environment and the living community. Physical factors play a key role, since the amount of rain, sunlight, temperatures and the type of soil largely determine the kinds of plants that can survive in an area. These factors change from north to south and with the presence of mountains or sea, among other features. In addition, all animals depend directly or indirectly on certain plants for food and shelter, and the presence or absence of these plants influences an animal's survival in a given habitat. Plant and animal species also affect each other and the physical environment. Depositing feces and urine, for example, may change the chemistry of soil or water. A bee that pollinates a flower helps the flowering plant to reproduce.

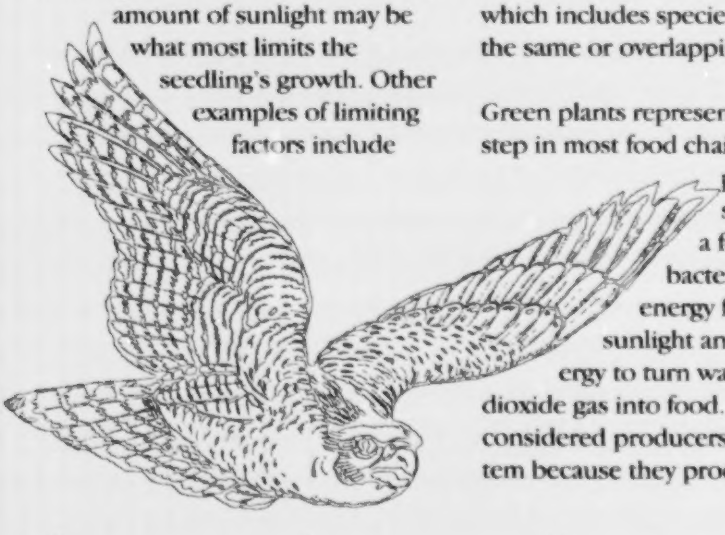
The Physical Environment:

Putting on a raincoat to stay dry. Turning up the air conditioner on a sweltering day. Wearing a hat to block the sun. These are all instances of human beings reacting to their physical environment. Wildlife, too, are affected by their physical environment, which determines in part the kind of habitat in which they live.

Species are adapted to live in a habitat with specific physical and chemical conditions. This includes weather (rainfall and temperature), soil (both the chemical nature and the supply of air and water available to plant roots), exposure to sunlight (sun or shade), and the composition of air (humans rely on a certain amount of oxygen in the air we breathe—that's why some feel out of breath when visiting a place of high altitude, where the air holds slightly less oxygen). Other parts of the non-living environment are also important in determining whether a plant or animal can survive in a given habitat. These include: wind, salinity (the amount of salt in the soil or water), geologic forms (such as mountains or rivers, which influence weather, and caves or rocks, which some animals use for shelter), fire and other disturbances, amount of oxygen dissolved in water (in aquatic habitats) and whether the soil, water or air have been polluted by significant levels of toxic substances.

Plants need sunlight, water and carbon dioxide gas to survive in their habitats. In addition, they require nutrients such as nitrogen and phosphorous to grow. Without sufficient amounts of these non-living factors, a plant would weaken and eventually die. All habitats must have both a suitable physical environment and the other plants and animals an organism needs to survive.

Many parts of the physical environment can become limiting factors when in short supply or in excess. Within a habitat, each species has factors that limit its growth or reproduction. In a desert, water—or the lack thereof—is a serious limiting factor to plant growth. Add water by irrigation, and plants grow more quickly. Stop irrigation, and growth returns to normal. For a tree seedling on the shaded forest floor, amount of sunlight may be what most limits the seedling's growth. Other examples of limiting factors include temperature, supply of minerals in soil, land for territory and the availability of food and nutrients. Temperature and other factors become limiting to growth and/or reproduction when they approach the limits of what a living thing can tolerate.



Food Chains and Food Webs:

Most organisms depend on other living things to meet their needs for food and often for shelter. Taking in food is critical to survival. From food, living things get the energy they need to be alive. Plants get their energy from the food they make through the process of photosynthesis, and animals get their energy by eating plants and other animals. The path through which energy and nutrients pass from one living thing to another is called a food chain. All living things are part of at least one food chain, which includes species that live in the same or overlapping habitats.

Green plants represent the first step in most food chains. During photosynthesis, plants (and a few types of bacteria) absorb energy from sunlight and use that energy to turn water and carbon dioxide gas into food. Plants are considered producers in an ecosystem because they produce the food that supports other living things in a food chain. Almost all animals rely, either directly or indirectly, on plants for food. Animals that eat primarily plants are called herbivores, or primary consumers, and represent the next link in the food chain. Animals called carnivores, or secondary consumers, eat herbivores and form the next level of the food chain. Some animals eat both plants and animals and are called omnivores. Many food chains end with a tertiary consumer, or a top predator, which eats secondary consumers.

Few food chains contain more than six species, since a large percentage of energy is lost at each transfer from the organism that is eaten to the one that eats it. For example, a rabbit feeds on grass for energy and then spends most of this energy digesting, moving and controlling its body temperature. The fox that eats the rabbit gets only a small fraction (about 10 percent) of the original energy stored in the grass. Because relatively little energy is passed from one link in the food chain to the next, food chains are not usually that long.

Energy loss also explains why those at the top of the food chain, top predators, are generally rare. Top predators like wolves and sharks must eat many smaller animals to get enough energy, and so a large population of wolves would not be able to find enough food. Primary consumers are much more common

Habitat Background

than secondary consumers, which are in turn more common than tertiary consumers.

Organisms are rarely part of just one food chain. A collection of food chains in a community form a living network called a food web. Decomposers are a part of all food webs and include microbes, fungi, and insects that break down dead plants and animals, returning essential nutrients to the soil. This process ensures that nutrients are available again for use by plants and microbes.

Predator and Prey:

Beyond providing food-energy for the predator, predator-prey relationships help keep populations of both species in check. When a predator is removed, prey population may grow out of control, beyond the ability of the habitat to support them. For example, in Arizona in the early 1900s, misguided management led to the elimination of huge numbers of wolves, mountain lions and coyotes—all top predators that ate mule deer—in the area . Without predators, the mule deer population grew from 4,000 individuals in 1907 to more than 100,000 in 1924. The huge population of deer stripped their habitat of all the leaves, plants and other greenery they used as food. With food scarce, many deer starved and fewer were able to reproduce. By 1939, the deer population had declined to just 10,000 individuals.

Other Interactions:

Food webs are not the only kind of interaction between living things in a habitat. Although you may not think about it, each time you seek shade under the boughs of a tree, you interact with the tree. Plants and animals in a community depend on each other to meet needs other than food, such as shelter, places to raise young and assisting in plant pollination and the distribution of seeds.

For a view of these other kinds of relationships, just look at a saguaro cactus. In the desert, mice and rabbits help disperse the seeds of the saguaro cactus to new locations. During its first years of life, a saguaro cactus needs shaded habitat. To meet this need, the cactus depends on other plants, such as a mesquite tree to protect it from the hot sun while the root system develops. Later in life, the cactus provides shelter (and food) to many other organisms. Gila woodpeckers build nests in it; once vacated, the nest may provide a home for elf owls, lizards, insects or spiders.

Like the saguaro cactus in the Sonoran Desert, prairie dogs are a keystone species on the short grass prairie. They live in "towns" made up of hundreds of underground burrows and tunnels in the grasslands of the American West. Burrows are built with chambers set aside for sleeping and storing food. Abandoned burrows provide shelter for many other prairie critters, including prairie rattlesnakes, black-footed ferrets and burrowing owls.

Life Cycles:

Many organisms have different needs as they go through the stages of their life cycle, especially organisms like butterflies that undergo metamorphosis. Butterflies look drastically different as adults than they did when they were young, as caterpillars. Their needs for food, water and cover also change. In these cases, the habitat of the young, or larval stage, of a species can be extremely different from the habitat of an adult. In this way, some species may have two or more distinct habitats for the different stages in their lives.

Specialists and Generalists:

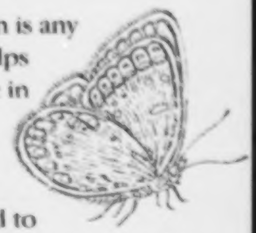
Scientists consider the members of a species generalists if they can live in a wide range of places and they can eat a wide variety of foods. Specialists, on the other hand, include species that have a narrow niche and have very specific habitat requirements. Generalists are better able to adjust to changes in the environment by finding a new source of food or cover. Populations of specialists grow when the resources they rely on are available, but may not be able to survive if changes threaten their only food, cover or nesting resource.

What is the Quintessential Generalist?
The raccoon! They are generalists found in many different ecosystems. Raccoons live in ecosystems as diverse as woodland, grassland, wetland, desert and seashore, not to mention the alleys of inner cities and suburban lanes. They live throughout North America – from Canada to Panama. ***What are their secrets for success?*** For one, they eat a varied diet, and can find nutrition from many different sources. Raccoon diets include plants, nuts, fish, rodents or the leftovers found in garbage cans. This flexibility means that if one source of food disappears, raccoons are still able to find another. For cover, they do not have specific needs. Any hole or crevice will do. Raccoons have been known to make hideouts in pipes, tree holes and small rock hollows.

Many plants are generalists, too. The red maple, a "super-generalist," grows in a variety of environmental conditions—wet or dry, rich or poor soil, sun or partial shade—allowing it to aggressively expand its habitat. In the 1900s, the maple began replacing oaks and other trees, as it moved from the southeastern forests into the Mid-Atlantic area and into the upland forests of the Northeast.

What About Specialists?
By contrast, monarch caterpillars depend on a single group of plants, the milkweeds, for food. By specializing on milkweeds, the monarch has evolved the ability to eat plants that other insects find poisonous. As a result, there is limited competition for milkweed leaves. But this same specialization makes monarchs vulnerable. If milkweed disappears from one area, monarchs may have to move to a new habitat. If anything threatens the plant over a larger area, or if the butterfly is forced into habitat where milkweed cannot grow, the caterpillar will not have anything to eat and monarch populations will die.

Adaptations:



An adaptation is any trait that helps an animal survive in its habitat.

Monarch butterflies have adapted to the environment in which they live. Diet, behavior, physical anatomy and even physiology (internal mechanisms), are ways animals adapt to their surroundings. Many living things have evolved unique ways of dealing with the problems of survival. An animal's adaptations develop over a very long time and can be passed on to offspring, such as an eagle's keen sense of sight or a hummingbird's long beak.

Animals have adapted to even the harshest environments. Some aquatic insects have evolved a way to survive extremely cold temperatures. They can freeze and still live! When the air warms up, these insects thaw and return to normal shape and activity —a process that most living things cannot do. Desert ecosystems are also challenging. But many plants and animals call the desert home, having adapted over thousands of years to life in a place that gets fewer than 10 inches of rainfall each year. These adaptations allow organisms like the kangaroo rat, which gets all the water it needs from plants it eats, and the saguaro cactus, which stores enough water to survive years, to live in the desert.

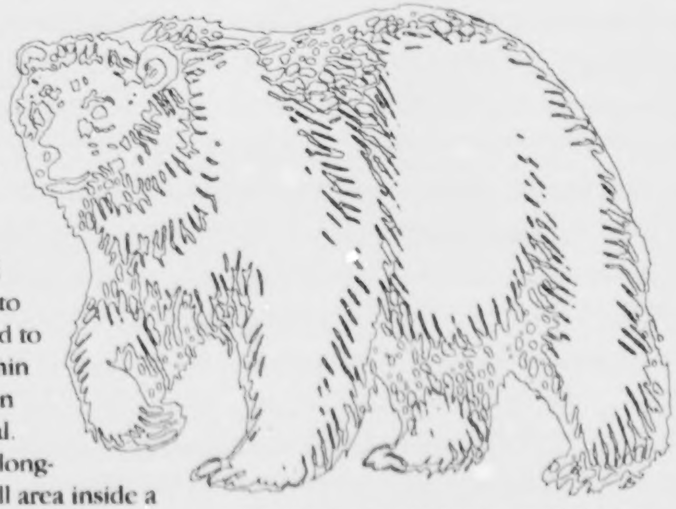
However, adaptations are useful only in the habitat for which an animal is adapted. A freshwater newt, used to living in or near water, wouldn't survive long in the desert.

People often confuse adaptation with adjusting or responding to a change in environment. Adjustment happens, for example, whenever humans climb to high altitudes.

On top of a 15,000-foot mountain, it feels colder and there is less oxygen to breathe. Humans adjust through behaviors like wearing warm clothes and staying inside a tent. Within a short time period, most humans go through a reversible physiological change, which allows them to breathe in a low-oxygen environment. Once climbers return to sea level, they return to normal. This is a temporary change that is not passed on to children. Adaptations are inherited from one generation to the next.

Habitat Size:

Animals differ in the size of habitat they require. In general, large animals need more food-energy to survive and so need to hunt or forage within a larger habitat than does a small animal. For the larvae of a long-horn beetle, a small area inside a single oak tree may be sufficient. These beetle larvae live below the tree's bark, creating tunnels as they feed on wood and hide from hungry predators. A squirrel might find cover in the same oak, but its habitat, which includes its entire foraging range, stretches over 3 to 4 acres. One kind of warbler bird requires 7,000 acres of forest habitat, while a black bear needs as much as 40,000 acres for its home range.



Many other factors influence habitat size. An organism's feeding habits, mobility, nesting preferences and whether it is territorial all play a role in determining the necessary habitat size. A bee, which has the mobility of flight and needs to find food with a high sugar content, has a much larger habitat than an ant. Plant-eating grazers like buffalo need only a quarter the habitat that carnivores such as wolves require. Leaves and grass are relatively common and easy to find for buffalo. By contrast, prey animals are much harder to find than grass, so their predators need to search a larger area to find them.

Biodiversity and Endangered Species:

Today, habitat loss is the leading threat facing wilderness, wildlife and North American biodiversity. Biodiversity is the enormous variety of living things found in the world today. One way to measure biodiversity is to count how many different species can be found within a given area. In a one-acre stand of Eastern forest, for example, you may find 30 species of trees. In a tropical rainforest, the same area might yield 200 tree species. Scientists conclude that rainforests have greater biodiversity, not just in trees but in all plants, animals and other forms of life.

Biological diversity has been recognized as an important measure of an

Habitat Background

ecosystem's health. All members of food webs, including humans, rely on healthy ecosystems to provide food and materials needed to live. The more diverse an ecosystem, the greater chance that some species will be able to survive sudden disturbances in the system caused by climactic change, human impacts or the loss of a key species.

Tropical rainforests face the greatest threats to declines in biodiversity, but much of North America has also suffered serious declines. In 1973, concern over the loss of wildlife led to the federal Endangered Species Act, which aims to protect the rarest species from extinction. To date, over 1,000 plants and animals in the United States are rare enough that they have been listed on the federal endangered or threatened species list. An endangered animal or plant has so few individuals left that it has been officially identified as close to extinction. Threatened species are not in such dire situations but have suffered rapid declines in their populations. The United States Endangered Species Act provides for active conservation and management of these species.

The sheer numbers of endangered, threatened and other vulnerable species has made conserving these species a difficult task. More recently, conservationists and federal managers have shifted the focus of their conservation efforts from single species to entire habitats of endangered and threatened species. Focusing on critical habitats, home to a diverse group of plants and animals, seems the most effective method to save wildlife. In saving the endangered habitat of a rare species, managers will also be able to save the many unique organisms that share that habitat.

Habitat Loss:

If humans alter a habitat by building on it, draining its water, plowing through its plant roots or polluting it, we risk losing all the habitat elements that allow plants and animals to thrive there. If this process continues indefinitely, a plant or animal may lose not only its local habitat, but its place in the world. For example, the dusky seaside sparrow has not been seen since 1987, a disappearance that scientists have noted as another extinction brought on by habitat loss. The sparrow's habitat had been changed and fragmented to such an extent that the birds had no suitable habitat left.

In a little over two centuries, much of the North American landscape has been altered by human activities including development of housing, roads and cities, farming, resource extraction, pollution and hunting.

Noteworthy Examples Include:

- Prairies once covered 40% of the lower 48 states. Much of this mid-western grassland habitat has been lost to farming, development and overgrazing. In addition, periodic fires that grasses depend upon have long been suppressed, allowing other species to flourish. Wild grazers like bison, which also played an important role in the grass ecosystem, were over hunted long ago. Scientists estimate that 99% of the tall grass prairies, which once stretched over 90 million acres on the eastern edge of the prairie states, have been lost to development and farming. The results of prairie loss are steep declines in many species numbers, including black-tailed prairie dogs and the very rare black-footed ferrets.

- More than 90% of old-growth forests of the Pacific Northwest have been disturbed by development and logging. Many species, such as the endangered Spotted Owl, need a mature forest habitat to survive.

- Over 50% of wetlands in the lower 48 states have been cleared, drained, filled or destroyed. Many of those remaining face problems with inadequate water supplies

Habitat Background

(due to upstream dams and diversions), polluted run-off from agriculture and industry and continued pressure for development. In California, only 10% of original wetlands remain, most lost to agriculture and development. Especially notable has been the shrinking of wetlands in Florida, where the Everglades once reached from above Orlando to the state's southern tip. The loss in wetlands there has contributed to a 90% drop in the number of waterfowl in the area. A full one-third of U.S. endangered plant species grow in wetland habitats.

- Although now recovering, more than 80% of New England forests were cut when Europeans settled the region and the land was converted to farmland. As agriculture has moved to the Midwest, eastern forests are slowly re-establishing themselves. However, acid rain—a by-product of modern industrial emissions—still poses a threat to the health of these ecosystems.
- The Southeastern United States was once covered in longleaf pine forests, which stretched from Virginia to Texas. Only about 3% of these historical ecosystems still exist, resulting in endangerment of birds like the red-cockaded woodpecker. The rest has long since been converted to cities, farms and tree plantations or has lost key habitat features due to logging, fire suppression and use of adjacent lands.
- Riparian (river) ecosystems face the greatest threats from dams, diversion of water and pollution. Most major rivers in North America are dammed to provide energy, control flooding and divert water for irrigation and other uses. Inadequate river water levels threaten wildlife that need clean, flowing water to drink or deep water for staying cool. In desert regions, where water is generally scarce, river habitats play an especially important role in supporting plants and animals.

Human Impacts:

As human populations continue to grow, more and more natural areas are developed or converted to crop land to meet increasing human demands for housing and food.

- Development—building houses, streets, highways, offices, schools, shopping centers and parks—is a leading cause of habitat loss. Building on wild land destroys or seriously degrades wildlife habitat.
- Converting wild habitat into farmland increases with our need to grow food for greater numbers of people. It also drastically changes the habitat. While some organisms, like migratory cranes on the Platte River that feed on waste corn from the harvest, can live with farms, others cannot.

- Run-off from farms, containing fertilizers and pesticides, can create problems in downstream habitats. If too much fertilizer washes into a lake, for example, the amount of available nitrogen and phosphate can completely alter the physical environment of the lake, creating huge algae blooms, which deplete oxygen and seriously harm or even kill other wildlife living there.

- Pesticides harm birds, butterflies and other insects. Birds of prey, for example, may suffer enormously from pesticides even though they may not consume them directly. Each animal they consume may have a small amount of the toxic substance in its body, and these amounts may accumulate in the bird's body over time.

- Human need for natural resources has led to extensive extraction in wild habitats. People use raw materials such as coal, petroleum, lumber and minerals like copper for industry and consumer products. Impacts of this extraction can be extreme and lead to soil erosion and pollution. Places like the Pacific Northwest, with a long history of logging, reveal the impact of resource extraction on wildlife and land.

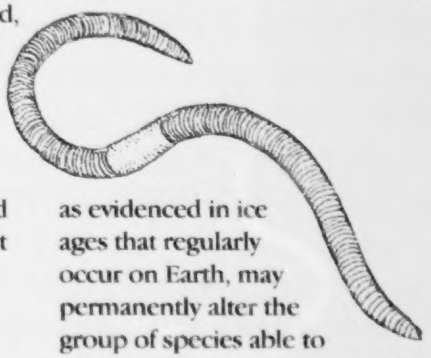
To save wildlife, we need to better balance human needs with conservation of habitats by taking actions that make a difference in our daily lives. (See Taking Action for Habitats at the end of this chapter for more information.)

Natural Impacts on Habitats:

There are many natural events that have big impacts on wildlife habitat. But even after a severe flood or fire, most ecosystems can recover. In most cases, the habitat develops back into a healthy community similar to the pre-fire or flood habitat over time.

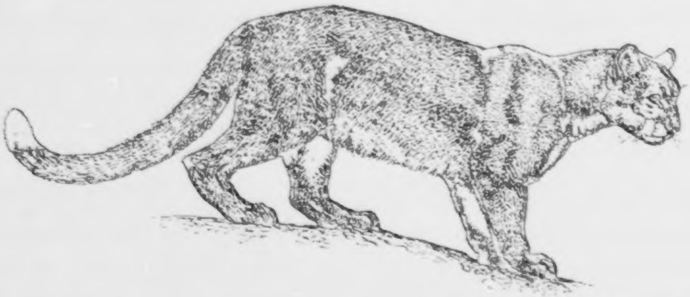
Other powerful natural impacts can come from disease, extremes in weather and climate change. Disease can destroy a population of one species, which may impact the lives of others. Some 250,000 ducks on Great Salt Lake appeared to have died from botulism, a bacterial disease, in 1932. While the local population of ducks was decimated, ducks from other areas eventually moved in and repopulated the lake. Even extremes in weather (an especially cold winter or long drought) can become lethal. Hurricane Hugo in 1993 destroyed many older longleaf pine trees that endangered red-cockaded woodpeckers rely on for nesting cover. Healthy populations can recover in time from this kind of event, but recovery is difficult for species already facing habitat threats or low population numbers. However, some habitats, such as Midwestern prairies or longleaf pine forests of the south, actually rely on periodic natural disturbances, such as fire, to stay healthy. Yellowstone National Park is a good example of such an ecosystem and a place where fires have long been suppressed to protect property and people in the area. When large wilderness fires erupted in Yellowstone in 1988, the burning did cause some tragic losses of wildlife and park facilities. But within a few short years, the many benefits of a natural fire (often started by lightning) became apparent. The park experienced an ecological re-birth, with greater plant and tree diversity, leading to greater animal diversity and a healthier, more stable ecosystem.

While most ecosystems have the resiliency to bounce back after a severe natural event, some changes may be too great. Climate change, as evidenced in ice ages that regularly occur on Earth, may permanently alter the group of species able to thrive in a habitat. Human activity also may change ecosystems irreversibly. For example, when a new species is introduced to a habitat,



Habitat Background

the entire structure of the place may change, never to return to its original state.



Introduced Species:

Sometimes non-native (called exotic) species are intentionally or non-intentionally introduced into habitats far from their own. Because exotic species usually have no natural predators, or because the native species are not adapted to handle their presence, the impacts of these species can be enormous, altering the entire structure of the habitat.

For example, the nutria, a small beaver-like mammal, was imported from South America and released into the wild in a number of regions in the U.S. early in the 1900s. Fur farmers wanted them for their pelts. In Louisiana, 20 animals were released in 1938. There are now 20 million living in the bayous and wetlands of that state. Their voracious appetite for wetland plants, added to their constant digging, has resulted in 100,000 acres of marsh turned into open water, destroying the winter habitat of waterfowl. They have now spread to 15 states. Aside from alligators in the Southeast, there are no natural predators to keep nutria in check.

The weedy and shade-loving English ivy plant is another example of a non-native species that has caused many problems for areas they invade. The ivy is native to Europe and Asia and was introduced into landscaping and gardens by some of America's early colonists. It has spread from gardens into many forests, where it creates dense cover on the forest floor and lowers plant diversity in the forest. Little sunlight reaches below ivy and the shade may prevent native wildflowers, trees and shrubs from sprouting and growing. These native plants are the ones wildlife rely on for food, cover and places to raise young. No animals appear to use ivy exclusively to meet their needs, save the European starling, another introduced, non-native species.

Habitat Fragmentation:

Wildlife habitats may be divided into smaller and smaller areas because of development or other land uses, such as roads, housing, parking lots, and lawns, until only unconnected fragments remain. Habitat fragmentation can lead to huge losses of wildlife because it affects habitat size, creates what is called "edge effects," and isolates species from other members of their population.

Some habitat fragments are just too small to provide for all the needs of a species. A black bear that needs 40,000 acres of forest habitat to survive will not survive in a 2,000 acre fragment. Even for species with a smaller habitat preference, the fragment may be too small to support enough individuals for a healthy breeding population.

Carving up a large natural area into smaller ones with more edges changes the qualities of an animal's habitat. Many bird species, for instance, live in the interior of a forest and have a hard time thriving along edges, where they are more vulnerable to attacks by predators. Physical factors along edges differ too – without the shade of the forest canopy, more sunlight reaches the ground and allows a thick understory to grow. Some birds need a relatively sparse area of forest floor to successfully forage for food.

Fragmentation also isolates populations or individuals by creating barriers to movement. Without forest cover, it may be harder for young to disperse to new areas. New individuals from other populations may no longer be able to reach those living in the habitat fragment, meaning that the genetic diversity of the population may decline. Studies show that the smaller the fragment size, the less species diversity.

Taking Action for Habitats:

People can make a difference! Wildlife habitat health can be monitored. Some losses can be minimized or the damage lessened by allowing natural periodic fires, reducing pollution, removing non-native species and limiting human use of sensitive areas. Conservation efforts have been successful in setting aside larger tracts of wilderness to remain undeveloped so that wildlife can continue to use the land. It is also possible to restore degraded wildlife habitat. Wetlands can be allowed to re-fill and people can work to keep water entering the ecosystem clean. In the Everglades, an ambitious habitat restoration project has begun. Federal and state agencies partnering with non-profit organizations and scientists have started work to bring wildlife back to the damaged ecosystem. The cost of such large-scale restoration, however, is great.

The Everglades restoration will cost billions of dollars. And even with this great effort and commitment, it may be centuries before natural biodiversity and complexity returns to this special place. Find out more information about the Everglades project at http://www.nwf.org/everglades/.

The Everglades project will take the work of many people to accomplish. But it can be done. And everyone can work to help save or create habitats for wildlife by working in their own backyards, neighborhood parks and schoolyards.

Build Your Own Habitat!

National Wildlife Federation's Backyard Wildlife Habitat™ and Schoolyard Habitats® programs help people turn their backyards, schoolyards, and community spaces into valuable wildlife refuges and teaches them the rewards of connecting with nature by inviting wildlife into their lives. These programs tutor everyone—no matter where they live—in small actions that positively impact the environment, encouraging the return of many wildlife species that have disappeared from our communities.

A Schoolyard Habitats site relies on diverse native plants and natural landscaping to provide the four basics for wildlife: food, water, cover and places to raise young. Once established, the positive impacts of habitat landscapes go beyond an individual schoolyard or community space. By eliminating yard chemical use, establishing storm water buffer areas and small wetlands, choosing plants wisely to eliminate supplemental watering and reducing lawn size, a Schoolyard Habitats site contributes to the health of the greater surrounding watershed and ecosystem.

The NWF Schoolyard Habitats Program's goal is to introduce educators, children, parents and community members to the wonders of nature and provide a hands-on learning opportunity. Hundreds of Schoolyard Habitats sites have been certified by NWF nationwide. Instructions for creating your own Schoolyard Habitats site at your facility are included in the Action Module.

For many inspiring tales of school grounds transformations, visit the Schoolyard Habitats program website at www.nwf.org/schoolyard-habitats.

Introduction to Habitats

SECTION 1

ACTIVITY
1

Have to Have a Habitat

Summary:
Participants define the terms "habitat" and "ecosystem" and explore examples of each.

Grade Level:
3-6

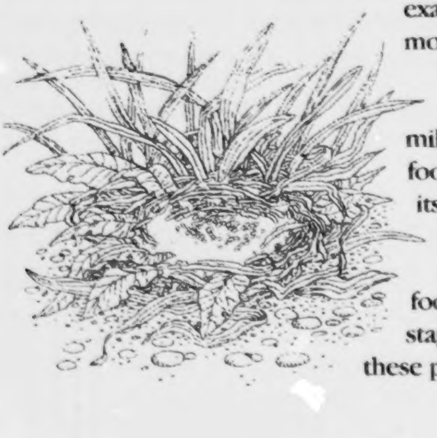
Time:
30-45 minutes

Learning Objectives:
Participants will be able to:
- ◇ Develop a basic understanding of habitats and how they relate to us.
- ◇ Identify the four major elements of all habitats.
- ◇ Distinguish the difference between the terms "habitat" and "ecosystem."

Materials Needed:
- ◇ Board or flip chart
- ◇ Chalk or markers
- ◇ Drawings of different ecosystems (supplied below), -OR- Pictures of different animals, plants, and habitats from magazines, old calendars, etc.
- ◇ Examples such as pinecones, rocks, sand, leaves, etc. (optional)

Background:

All life on Earth has a place where it makes its home, called its **habitat.** An organism's habitat might include an area as small as an earthworm's pile of dirt, or it might include a vast corridor of plants and insects along the flight path of a migratory bird. Habitat for an animal consists of all the elements the animal needs to survive and raise healthy young. The most basic of these elements include the appropriate type and amount of **food**, **water**, **cover**, and **places to raise young**. This is true for all animals, whether human or coyote, horse or snake, kitten or centipede. Cover may include protection from the elements or from predators, and may often have different qualities that enable their offspring to thrive (places to raise young).

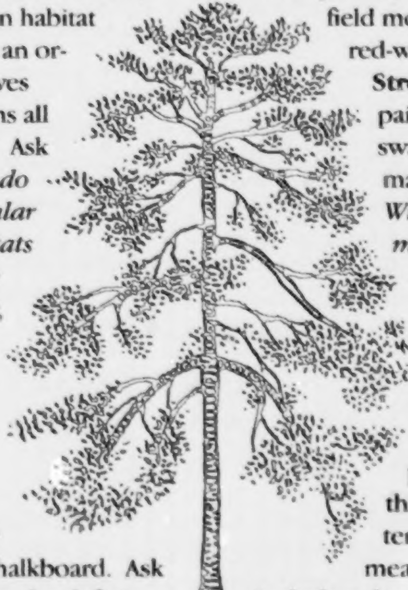


Many animals have very specific requirements for their habitat. These animals are called **specialists**. For example, the monarch butterfly depends primarily on milkweed as a food source for its young, and on other flowering plants as food for its adult stage. Most of these plants grow only in clearings or on the edge of forests. Other animals, called **generalists**, can survive in a variety of situations. Raccoons are a good example, since they eat everything from nuts and insects to small mammals and human garbage, and will live anywhere with decent cover and an adequate water source.

While the term habitat focuses on a particular organism and its needs, the term **ecosystem** encompasses a whole community of living things, non-living elements, and their interrelationships. For example, the gopher tortoise finds important elements of its habitat in a longleaf pine woodland ecosystem, found in parts of the far Southeastern United States and characterized by dry, sandy soil. There, it digs long burrows in the sandy soil for shelter from predators and the oppressive heat. It also depends on grasses and leaves of low-growing plants for food. While both sandy soils and low-lying plants may be found in the longleaf pine forest mentioned above, the gopher tortoise may find these elements in Central Florida's dry scrubland ecosystem, or in areas of thick undergrowth that lie between beaches and dunes, which are called coastal strand. So in other words, the pine forest, scrubland, and coastal strand ecosystems are all three distinct communities containing a wide variety of plants and animals, and may happen to also support gopher tortoise habitat. This activity can serve as an excellent lead-in to some of the following outdoor activities, such as "Animal Homes Hike" (p.154) or "Habitat Hunt" (p.166).

What to Do:

1. Ask participants, *Do you know what a habitat is? What does it mean?* Write down answers participants give. Using these answers, lead a discussion on habitat as the place where an organism normally lives and where it obtains all it needs to survive. Ask participants, *What do animals in particular need in their habitats in order to survive* (food, water, cover, and places to raise young)? During the discussion, write down, or have a participant write down each answer on a flip chart or chalkboard. Ask the group to discuss the definition of each basic need, and write or have a participant write the definitions. Use pictures or examples to highlight the discussion. For example, an adult monarch butterfly gets its food from the nectar of different flowers, may drink water from dew on leaves, seeks shelter from hard wind in grasses or branches of a tree, and lays eggs on milkweed plants. They and their young are generally safe from predators because the milkweed they eat as caterpillars makes them toxic to most animals.



2. Ask participants, *What is an ecosystem?* Give some simple examples, such as a forest, a field, or a pond. Ask, *What animals live in each ecosystem?* (Examples: **Forest:** woodpecker, squirrel, centipede, field mouse, grasshopper, red-winged blackbird; **Stream:** mayflies, trout, painted turtle, frog, swamp dragonfly, salamander, alligator.) *What are some elements of habitat for those animals? Do some animals live in more than one ecosystem?* Show the supplied drawings or pictures/posters of at least three different ecosystems (e.g., a forest, a meadow, and a pond). Include at least two ecosystems that might exist next to each other to show that some animals find parts of their habitat in different ecosystems. If possible, have props that go along with the pictures to help illustrate each ecosystem. For example, if showing a picture of a forest, pass around some pinecones, nuts, leaves, etc. Have the group list different animals that live within each ecosystem, and how each object serves as a part of animal habitat (e.g., a twig might become part of a bird's nest, a nut might be food for a squirrel, etc.).

3. Discuss the needs of at least three animals. Ask, *How are these needs different? How are they alike?* Ask participants why it is important that an ecosystem have many different elements of habitat for different animals (e.g., so different animals have a place to live, so animals won't become extinct, for beauty, for recreation, etc.).

For Younger Participants (Grades K-2):

Make sure to use many pictures from magazines and have a collection of objects found in the different ecosystems so that participants can explore with their hands. If possible, visit a local natural history museum and explore different ecosystems, examples of wildlife that live in each, and elements of habitat that these animals need to survive.

For Older Participants (Grade 7 and Up):

1. Have participants discuss ways that the different ecosystems might be connected. Ask, *What animals* *might live in more than one type of ecosystem?* Ask for other ways animals might rely on more than one type of ecosystem.

2. If possible, have participants take a walk outside and have them guess what animal habitats surround the facility where they meet. Have them show evidence (i.e., the types of plants, the amount of water nearby, etc.). The participants can get as general or specific as they wish, depending on their knowledge base, so answers might be as general as "deer habitat" or as specific as "northern flying squirrel habitat."

3. Have participants count the number of different ecosystems in the area and guess what type of animals might live in each one. Then ask again how the different ecosystems might be connected.

Questions:

- What is a habitat?
- What do all animals need their habitat to provide for them to survive?
- Why is it important to have different types of habitat in an area?
- What is the difference between a habitat and an ecosystem?

Adaptations:

Please refer to general adaptations on pages 11-16.

Hearing Disabilities:

- Use a variety of habitat and animal pictures and hands-on examples. Use items such as sand and seashells, jars of pond water with magnifying glasses, acorns, and bird's nests to help illustrate each of the different habitats. Have examples that can be smelled, such as pine needles or flowers. Allow participants time to explore the examples.

Learning/Cognitive Disabilities:

- Use a variety of habitat and animal pictures and hands-on examples. Use items such as sand and seashells, jars of pond water with magnifying glasses, acorns, and bird's nests to help illustrate each of the different habitats. Have examples that can be smelled, such as pine needles or flowers. Allow participants time to explore the examples.
- Use sound effects when possible (e.g., bird calls, nature sound tapes, etc.).

Motor Disabilities:

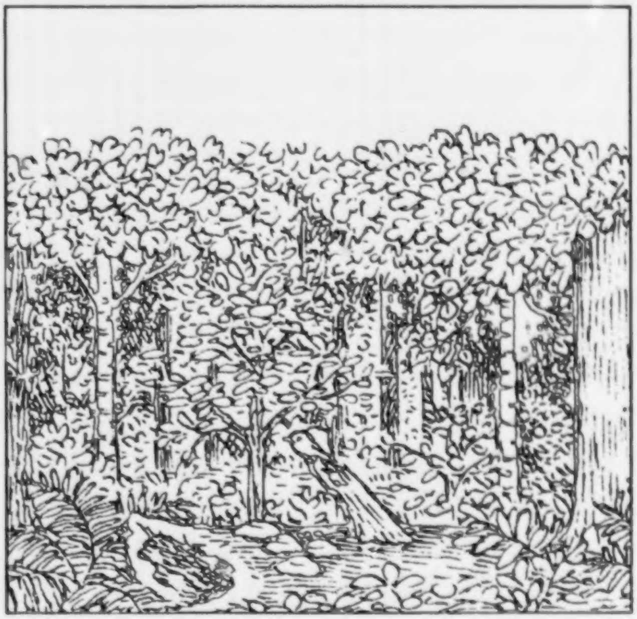
- No additional adaptations necessary.

Visual Disabilities:

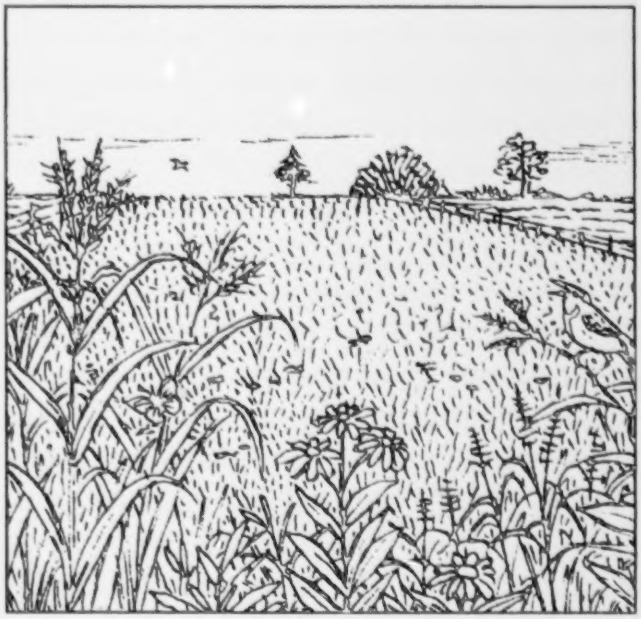
- Use tangible items participants can touch to illustrate your points when possible (e.g., leaves, pine cones, rocks, soil samples, etc.). Have examples that can be smelled, such as pine needles or flowers. Allow participants time to explore.
- Use sound effects when possible (e.g., bird calls, nature sound tapes, etc.).

Have to Have a Habitat

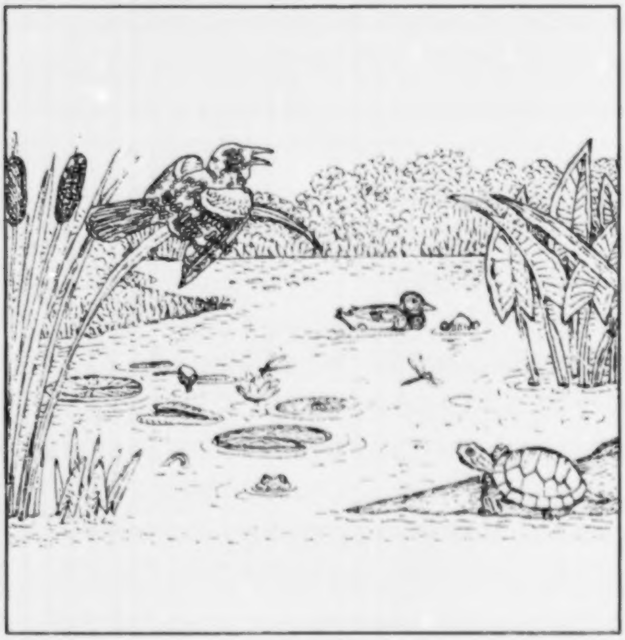
WORKSHEET



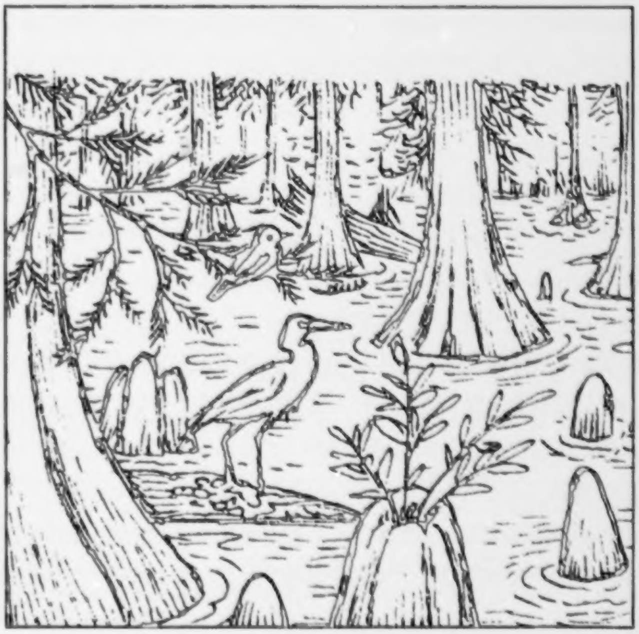
Forest



Meadow



Pond



Swamp

ACTIVITY
2

Habitat Web

Summary:
Participants explore the web of connections among living and non-living things.

Grade Level:
K-6

Time Needed:
45 minutes

Learning Objectives:
Participants will be able to:
- ◇ Create a web that connects various living and non-living things within a habitat.
- ◇ Understand how many living things are connected.
- ◇ Observe the effect of a broken habitat web (e.g., through pesticide introduction).

Materials Needed:
- ◇ Ball of yarn
- ◇ Large index cards or construction paper
- ◇ String or pins

Background:

All plants and animals have a particular place or area where they live called their **habitat**. While the term habitat generally focuses on a particular organism and its needs, the term **ecosystem** encompasses a whole community of living things, non-living elements, and their interrelationships. An ecosystem, on some level, can be thought of as a complex, shared habitat.

Plants and animals have many important interactions within their community and depend on different factors in their environment. Animals depend on plants or other animals for food and may use different plants for cover. Many plants need insects to pollinate them and earthworms to tunnel about so they move air into the soil. Decomposers, including earthworms, fungus and bacteria, live off dead plant and animal matter. They break down this material and make nutrients more available for plants. Environmental factors such as climate, the amount of sunlight, the amount and type of water available (e.g., clean, moving, stagnant), and the type and condition of soil in the area determine how different plants and animals will fare in a given area.

In this activity, participants will have an opportunity to think about many different interactions within an ecosystem. In addition, this activity illustrates the interconnections of all living things. This is an important concept to learn in order to understand more complex issues, such as the effects of drought, exotic species, pesticides and habitat loss.

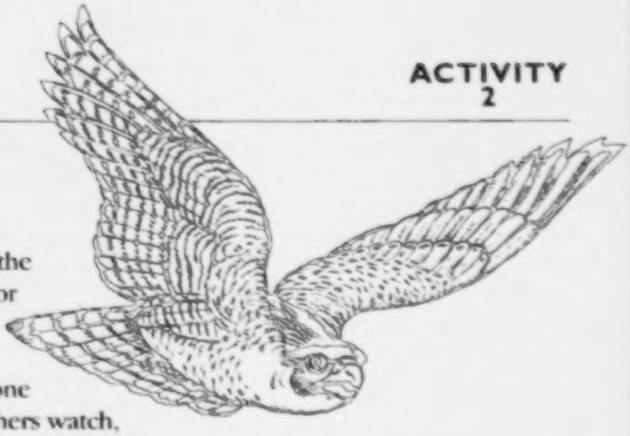
What to Do:

1. Explain to participants that for this activity, they will have a chance to create a web of connections between many different living and non-living things found in a habitat.

2. Have participants help prepare habitat web cards ahead of time. These cards will indicate a particular plant, animal, or non-living element and will each serve as a player's identity for each round. Cut out the cards created for the Forest Habitat (found at the end of this activity) or have the group help create new ones with index cards and markers or crayons. If possible, laminate the cards. Punch a hole in the top of the finished card and attach a string so that participants can hang the cards from their necks (alternately, pin them on participants' clothing). If the group

Habitat Web

ACTIVITY 2



creates new cards, see Steps 3 and 4 below. Otherwise, skip to Step 5.

3. On each index card, write the name of a plant, animal, decomposer, or non-living element found in a particular ecosystem. If possible, include a picture or drawing of the element on the card. You may wish to color-code the cards for their roles as producers, consumers, decomposers, or non-living elements.

4. You may wish to use a local field guide to create a web directly related to your area. When making the cards, create a good mix of living and non-living elements. Make sure to include a good distribution of carnivorous (meat-eating), herbivorous (mainly plant-eating), and omnivorous (plant- and meat-eating) animals. Also, a set of cards should have the potential to meet the basic needs (i.e., food, water, cover, and places to raise young) of the animals. Some sample habitat webs are given below.

5. After the cards are complete, discuss the concept of habitat and the fact that animals need to find food, water, cover, and places to raise young in their habitat. If they have already done "Have to Have a Habitat" (p. 34), this is an excellent time to review the concepts.

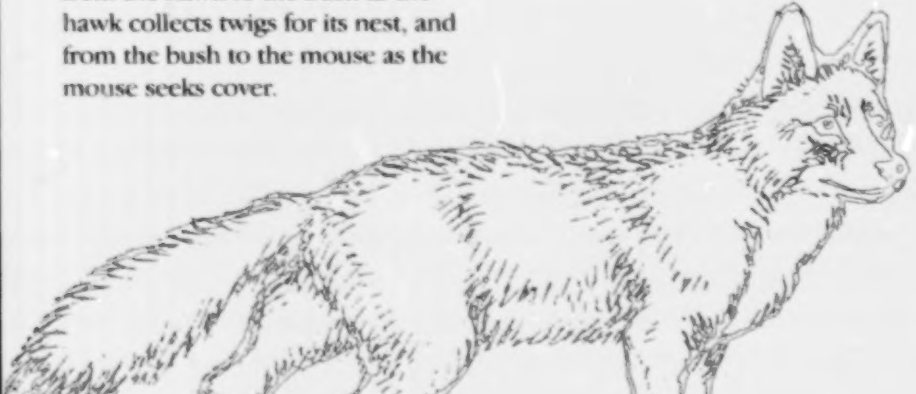
6. Have participants sit or stand in a circle. Hand out habitat web cards to each participant. Run the activity in one big group or divide participants into groups of eight to ten. With small groups, help one group begin while the others watch, and then have them all try it. Make sure that with small groups all the major groups (e.g., non-living elements, plants, invertebrates, fish, birds, reptiles/amphibians, mammals, and decomposers) are represented at least once, and that there is a good mix of herbivores and carnivores (or omnivores). Participants should understand what their card represents and what role they would play in their ecosystem. If necessary, have participants say a few words about their cards before beginning, have other participants help out, or review some of these concepts. If possible, have volunteers oversee small groups.

7. Any participant may start the web by holding on to one end of the ball of yarn and passing the ball to another member of the circle. Before participants pass the ball on, however, they should think about the connection between their habitat web card and that of the person to whom they are passing the yarn. When the participants pass the ball, they should explain this connection. For example, a participant who has a woodpecker card might throw the ball to a person with a tree card and say, "The woodpecker lives in a tree." The next person holds onto the yarn and throws the ball to someone else, also explaining the connection; "The tree is cover for a deer." Assist participants in coming up with accurate connections, while at the same time encouraging them to be creative. Each time the yarn is thrown, the person throwing it holds onto a piece of it so that eventually, the participants create a web of yarn. The connections go on until everyone has a piece of the yarn. Make sure the tension is tight enough so that participants can feel the interconnectedness of all the different elements.

8. Point to one of the participants and announce that his or her organism has been wiped out. The cause can include human impacts, such as pesticides or habitat removal, and natural events, such as flooding or disease. When an organism dies, he or she should give a tug to the web, and then the next person who feels the tug should give a (small) tug back and raise his/her hand. This can continue as different people feel the tug. Point to each person who is affected by this creature. You can repeat this procedure several times with different examples.

9. This activity will be different every time, since plants and animals interact with each other and their environment in many different ways. If they wish, participants may try the activity several times. One way to do this in the same round is to have more than one ball of yarn, each a different color. When participants finish creating one web, they would then begin another one with a different color. Each color would indicate a different set of interrelationships in one ecosystem. For example, one color might involve passing food energy along a chain, and it might look like this: the sun gives energy to a blueberry bush, a mouse eats a blueberry, and a hawk eats the mouse. The next color might represent other important roles of habitat; it would reach from the sun to the hawk as the hawk warms itself, from the hawk to the bush as the hawk collects twigs for its nest, and from the bush to the mouse as the mouse seeks cover.

10. Discuss different events that can affect an ecosystem. Ask the group what would happen if two organisms died out at the same time. Discuss different scenarios. Some examples of questions might include the following: ***What might happen if all the trees were removed? When might this happen in real life? What can we do to help? What if we just remove all the dead trees? What would happen if we kill all the mosquitoes with pesticides?*** As you have this discussion, have the person who was left with the ball of yarn give a tug and then pass the ball back to the person who felt the tug. As each person feels the tug, he/she can drop their arm and help to roll up the yarn.



Questions:

- What are some ways that plants, animals, and non-living things are connected?
- How are we as humans connected to our own ecosystem?
- What happens to an ecosystem if organisms die out or a non-living element is altered?

Adaptations:

Please refer to the general adaptations on pages 11-16.

Hearing Disabilities:

- Create a poster of a habitat web you will not be creating in the activity to help illustrate the concept.
- Include both the names and pictures on habitat web cards.
- Have participants signal to a participant who is deaf or hard of hearing before they toss the ball of yarn to him or her.
- If working with a large group, break participants into groups of 8-10 so participants can be closer together to accommodate lip readers.
- Have the sign language interpreter narrate the game for the participants as needed.

Learning/Cognitive Disabilities:

- Create a poster of a habitat web you will not be creating in the activity to help illustrate the concept.
- Create large habitat web cards

with both the name and pictures on them.

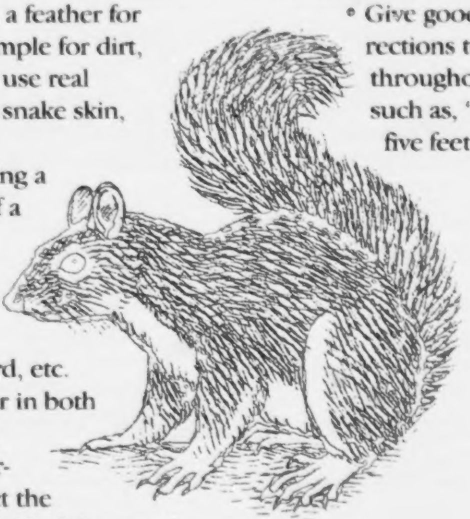
- Have everyone go around the circle and state their symbol and one way they are connected to the web (e.g., "I am a squirrel and I live in a tree.").
- Have all participants toss the yarn underhanded for better control. If desired, sit on the ground to play the game.
- Narrate the game to decrease confusion as needed.

Motor Disabilities:

- Use a large ball of yarn or wrap yarn around a foam ball for those with limited upper extremity motor control.
- If there is a participant who uses a wheelchair in the group, have all participants sit in chairs to play the game.
- Wrap the string around the arm of the participant's wheelchair or other assistive device, or gently around his/her wrist if he/she are unable to hold the string. If wrapping the yarn around the wrist, check throughout the game to make sure it is not too tight.
- Assist participants with throwing and catching as needed. Have all participants toss the yarn underhanded for better control.

Visual Disabilities:

- Make large habitat web cards on white paper. Print names in large block letters with a thick black marker. Put Braille labels on each of the cards for participants who are blind.
- If desired, use items to help illustrate the cards while explaining the habitat web. For example, a ball for the sun, representative plastic animals, a feather for a bird, a soil sample for dirt, etc. If possible, use real items such as a snake skin, leaves, etc.
- Consider creating a tactile poster of a habitat web, with items such as bark for a tree, a feather for a bird, etc. Label the poster in both large print and Braille. Draw arrows to connect the items with thick black lines and raised lines of glue or yarn.
- Have everyone go around the circle and state their symbol and their location in the circle to help with orientation during the game.
- Narrate the activity as it progresses.
- Have participants call out each other's symbols/names before they toss the yarn. Make sure that participants have the attention of participants who are blind or have low vision before tossing or rolling the yarn to him/her.
- Have someone ring a bell behind the participant who will be on the receiving end of the ball of yarn to increase orientation.
- Consider playing the game seated and rolling the ball of yarn.
- Assist participants with throwing and catching as needed. Have all participants toss the ball underhanded for better control.
- Give good orientation directions to participants throughout the game, such as, "The oak tree is five feet in front of you."



Forest Habitat Web

- Sun
- Five plants e.g., grass, wildflower, poison ivy, oak tree, pine tree
- Five insects/spiders e.g., ladybug, bumblebee, wasp, earwig, potato bug, spider, butterfly
- Three reptiles or amphibians e.g., lizard, frog, snake, turtle, salamander
- Two fish e.g., trout, salmon, minnow
- Three songbirds e.g., robin, mockingbird, sparrow, warbler, finch
- Two raptors e.g., kestrel, hawk, eagle, kite, vulture
- Three small mammals e.g., mole, mouse, chipmunk, squirrel, bat, rabbit
- Two medium-sized mammals e.g., woodchuck, badger, raccoon, coyote, bobcat
- Two large mammals e.g., mountain lion, bear, deer, moose
- Three decomposers e.g., fungus, bacteria, earthworm, dung beetle
- Three non-living components e.g., water, soil (and/or rocks), air

Wetland Habitat Web

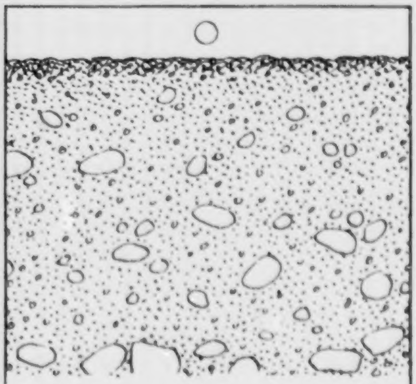
- Sun
- Five plants e.g., skunk cabbage, swamp lily, Venus flytrap, blueberry bush, cypress tree
- Five insects/spiders e.g., black fly, dragonfly, diving beetle, fishing spider, butterfly
- Three amphibians or reptiles e.g., salamander, newt, frog, snake, turtle
- Three fish e.g., sunfish, bass, perch, eel, minnow
- Three water birds e.g., Canada goose, wood duck, blue heron
- Two raptors e.g., eagle, osprey, hawk, owl
- Three small mammals e.g., mouse, shrew, muskrat, mink
- Two medium mammals e.g., beaver, otter, raccoon, bobcat
- Two large mammals e.g., deer, moose, black bear
- Three decomposers e.g., fungus, bacteria, aquatic worm, scavenger beetle
- Three non-living components of habitat web e.g., water, soil (and/or rocks), air

Coastal Habitat Web

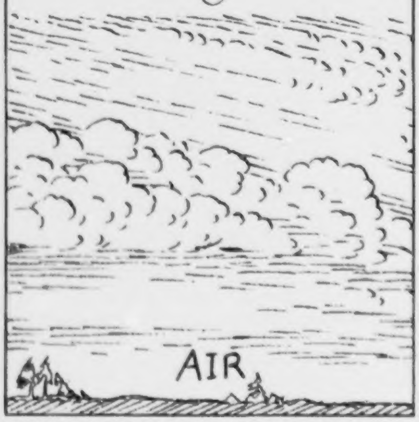
- Sun
- Five plants e.g., marshland grass, seaweed, cypress tree, beach grass, dune wildflower
- Five seashore animals e.g., crab, shrimp, jellyfish, sponge, mollusk
- Five small to medium-sized fish e.g., mackerel, herring, mullet, salmon, flounder
- Three large fish e.g., shark, ray, eel
- Three reptiles e.g., sea turtle, lizard, snake
- Three birds (non-raptors) e.g., duck, pelican, heron, gull, sandpiper
- Two raptors e.g., eagle, osprey
- Two coastal-dwelling mammals e.g., sea lion, sea otter
- Two sea-dwelling mammals e.g., whale, dolphin
- Three decomposers or filtering animals e.g., bacteria, sea worm, oyster
- Three non-living components of habitat web e.g., water, soil (and/or rocks), air

Habitat Web

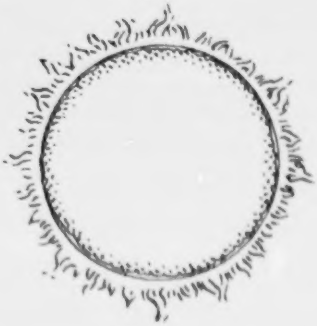
WORKSHEET



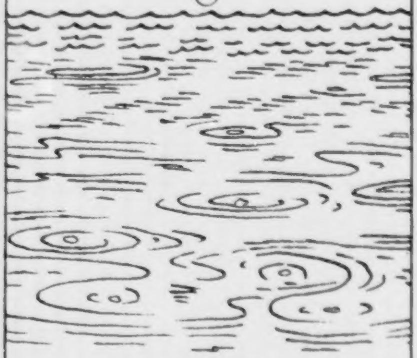
SOIL



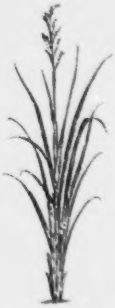
AIR



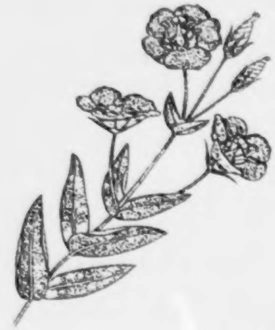
SUN



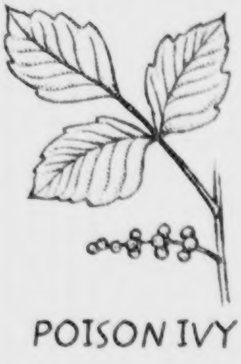
WATER



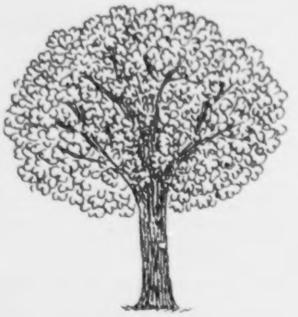
GRASS



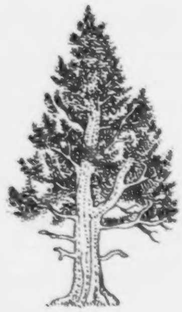
WILDFLOWER



POISON IVY



OAK TREE



PINE TREE

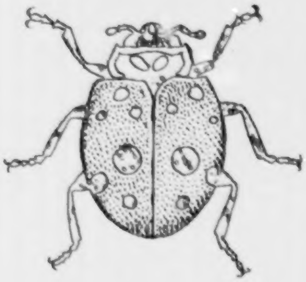
WORKSHEET

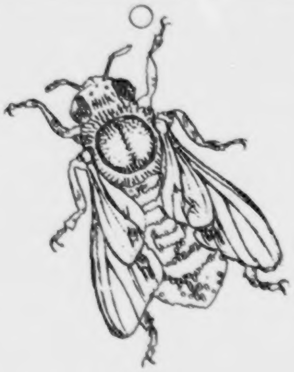
Habitat Web

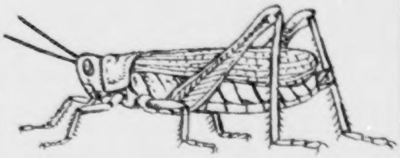
○ Non-Living Element	○ Non-Living Element	○ Non-Living Element
○ Plant	○ Plant	○ Non-Living Element
○ Plant	○ Plant	○ Plant

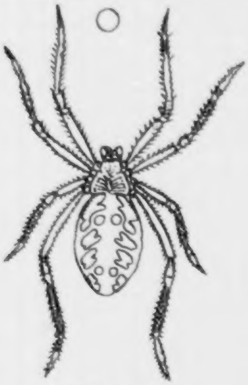
Habitat Web

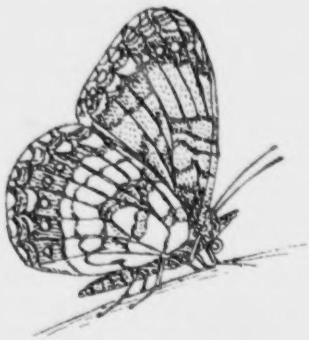
WORKSHEET

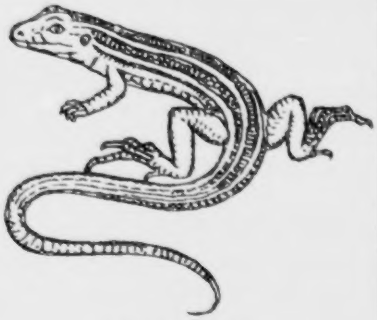

LADYBUG

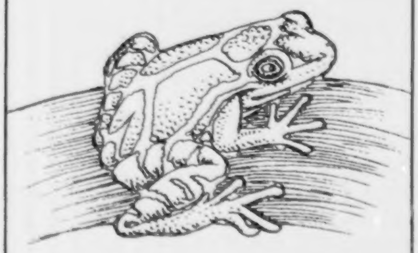

BEE

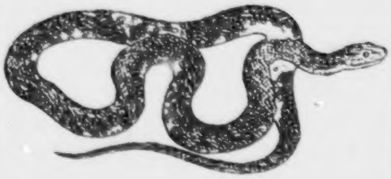

GRASSHOPPER

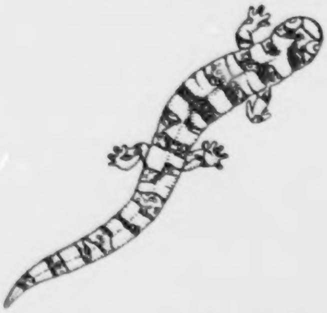

SPIDER


BUTTERFLY


LIZARD


FROG


SNAKE


SALAMANDER

Insects and Spiders

Insects and Spiders

Insects and Spiders

Reptiles and Amphibians

Insects and Spiders

Insects and Spiders

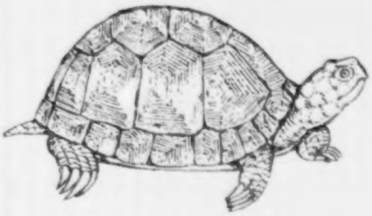
Reptiles and Amphibians

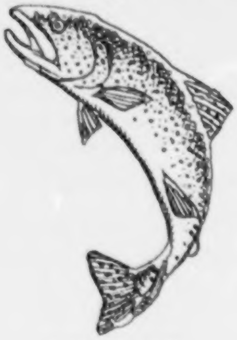
Reptiles and Amphibians

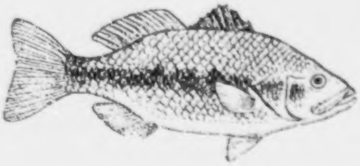
Reptiles and Amphibians

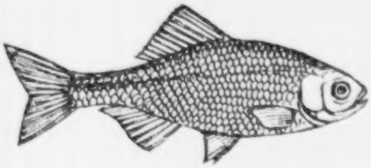
Habitat Web

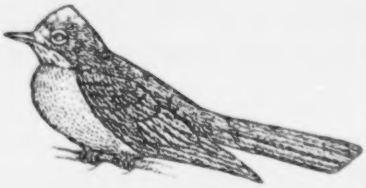
WORKSHEET

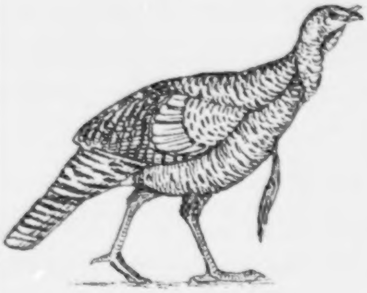

TURTLE

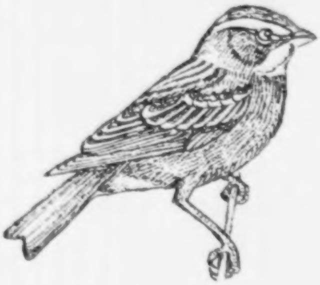

TROUT

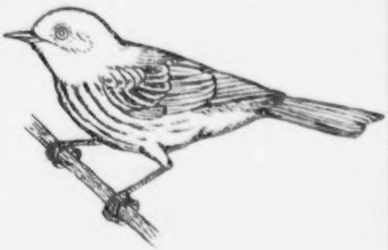

BASS

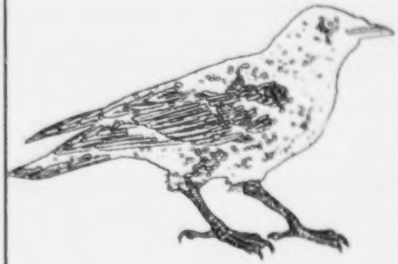

MINNOW


ROBIN


TURKEY


SPARROW


WARBLER


CROW

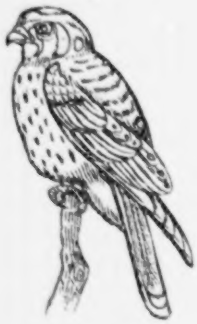
WORKSHEET

Habitat Web

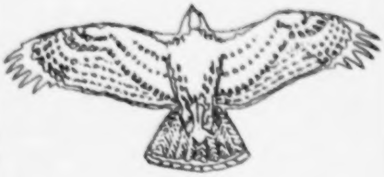
○ Fish	○ Fish	○ Reptiles and Amphibians
○ Birds	○ Birds	○ Fish
○ Birds	○ Birds	○ Birds

Habitat Web

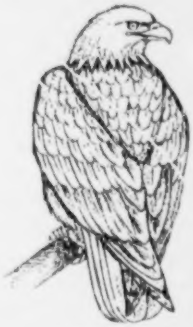
WORKSHEET



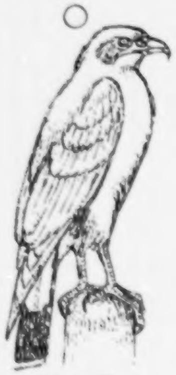
KESTREL



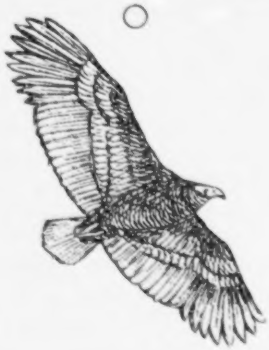
HAWK



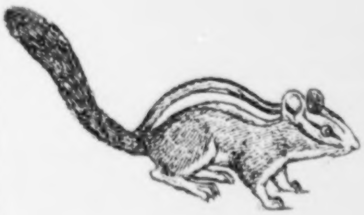
EAGLE



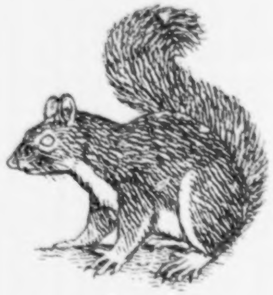
KITE



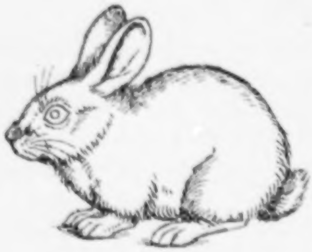
VULTURE



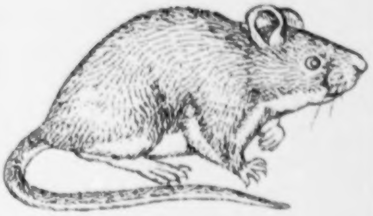
CHIPMUNK



SQUIRREL



RABBIT



WOODRAT

○

Birds of Prey

○

Birds of Prey

○

Birds of Prey

○

Small Mammals

○

Birds of Prey

○

Birds of Prey

○

Small Mammals

○

Small Mammals

○

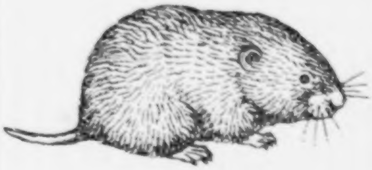
Small Mammals

52

Habitat Web

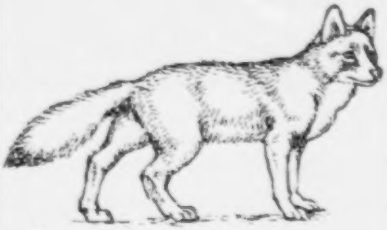
WORKSHEET

○



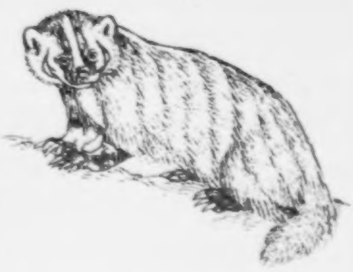
VOLE

○



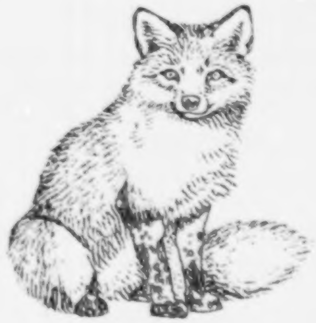
COYOTE

○



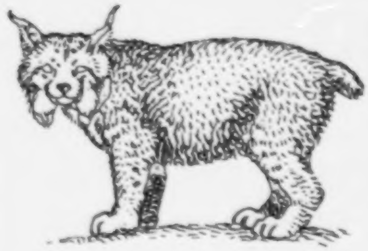
BADGER

○



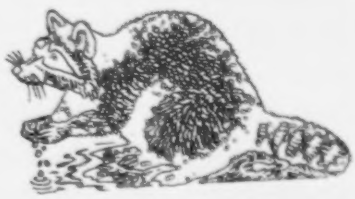
FOX

○



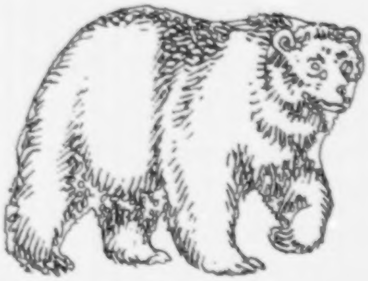
BOBCAT

○



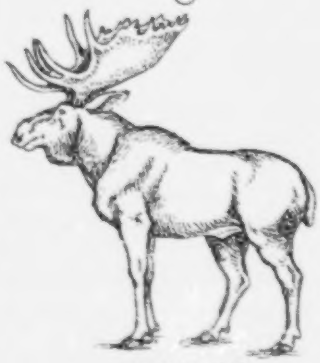
RACCOON

○



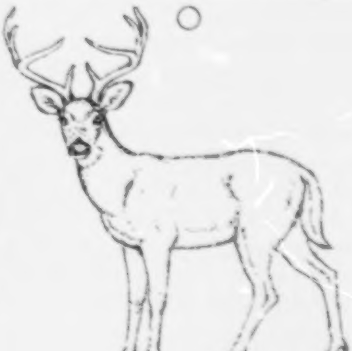
BEAR

○



MOOSE

○



DEER

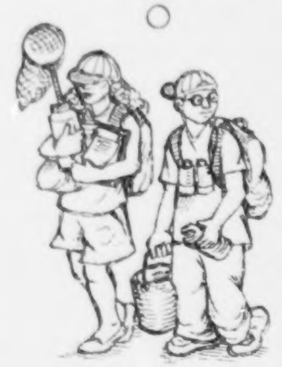
WORKSHEET

Habitat Web

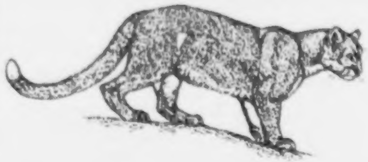
○ Medium-Sized Mammals	○ Medium-Sized Mammals	○ Small Mammals
○ Medium-Sized Mammals	○ Medium-Sized Mammals	○ Medium-Sized Mammals
○ Large Mammals	○ Large Mammals	○ Large Mammals

Habitat Web

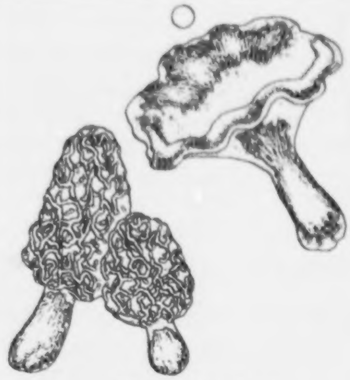
WORKSHEET



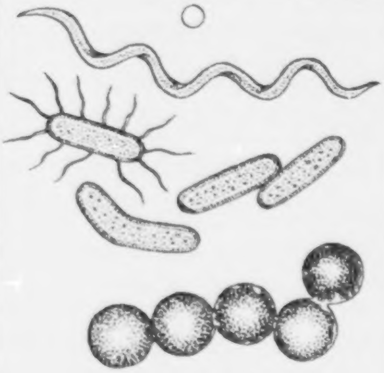
HUMANS



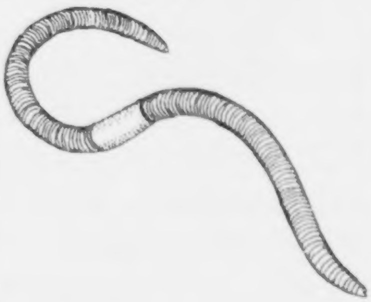
MOUNTAIN LION



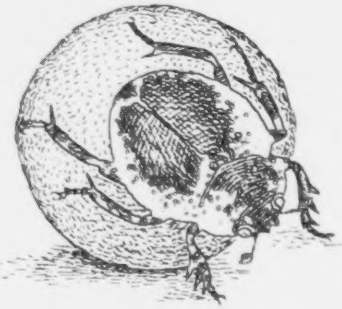
FUNGUS



BACTERIA



EARTHWORM



DUNGBEETLE

Decomposers

Large Mammals

Large Mammals

Decomposers

Decomposers

Decomposers

Designing Wildlife Habitats

ACTIVITY 3

Background:

While each habitat is unique to a particular species, all wildlife habitat provides common elements that enable the species to survive, including food, water, cover, and places to raise young. Creating a three-dimensional model of habitat for wildlife is a great way to reinforce learning and explore different types of wildlife habitat. In this activity, participants will conduct habitat research as well as use their creativity to make models. It is also a great opportunity to compare the habitats of local wildlife to other types of wildlife habitats the participants may be interested in.

What to Do:

1. Ask, *Would you like to create your own model wildlife habitat? What would they need to include?* Lead participants in a discussion identifying the four key elements (food, water, cover, and places to raise young) they must include in their habitat model.

2. Review the term habitat with the group, including the four key elements. Have participants think of several animals and describe each animal's habitat. For example, white-tailed deer habitat consists of a mix of open land and woodland. They need the cover a forest provides, and favor as food, the leaves and grasses that grow in open land or at the edge of forests. List examples on a chalkboard or flip chart.

3. Break the group into teams (either pairs or small groups, depending on overall group size). Tell them that in order to create a model wildlife habitat, they must first determine the animals they have in mind for the project. Have each group pick one animal. Emphasize that at least one team should create habitat for a local animal. For younger participants, or for teams having difficulties deciding on their animal, assign each group a region or an ecosystem (e.g., forest, desert, coastal, etc.), and have them brainstorm animals found in those areas.

4. Set up research stations with different reference materials for teams to explore. If possible, assign a volunteer to assist at each research station.

5. Give each team a copy of the Model Wildlife Habitat worksheet to complete. This will aid them in research as well as be useful for the presentation portion of the activity. Give participants ample time to research their animal and the habitat in which it lives.

6. Once the research is completed, give each team a collection bag. Head outside to collect items such as rocks, twigs, leaves, etc. for the model habitats.

Summary:

Participants create a hands-on model of a wildlife habitat.

Grade Level:

K-6

Time:

2 hours

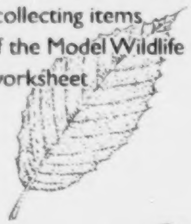
Learning Objectives:

Participants will be able to:

- ◇ Investigate the elements of habitat for a particular animal.
- ◇ Create a three-dimensional model of a wildlife habitat.
- ◇ Compare different types of wildlife habitats.

Materials Needed:

- ◇ Field guides and other reference books and resources on various animals and their habitats
- ◇ Pictures of different animals in their habitats
- ◇ Construction paper
- ◇ Glue or paste
- ◇ Markers, crayons, and/or colored pencils
- ◇ Clay
- ◇ Various items such as craft sticks, film canisters, cotton balls, etc.
- ◇ Foam trays or shoe boxes
- ◇ Bags for collecting items
- ◇ Copies of the Model Wildlife Habitat worksheet
- ◇ Pencils



Note: Make sure participants do not collect any living things for their habitats.

7. Give each team a shoe box or foam tray to use for their model. If desired, participants can create larger models in shipping boxes or on pieces of foam core board. Provide a variety of art supplies and items to supplement the natural items the participants collected. Remind the teams that each of the four elements of habitat must be represented in their models. Give teams about 1 hour to create their models, and label as appropriate.

8. Once everyone is finished, have each team make a presentation to the group. Have group members ask questions of the presenters. Discuss the differences and similarities of the different types of wildlife habitat, making sure to relate the discussion to the habitats of local wildlife. After all the presentations, put the models on display with the worksheets attached for participants to further explore.

For Younger Participants (Grades K-2):

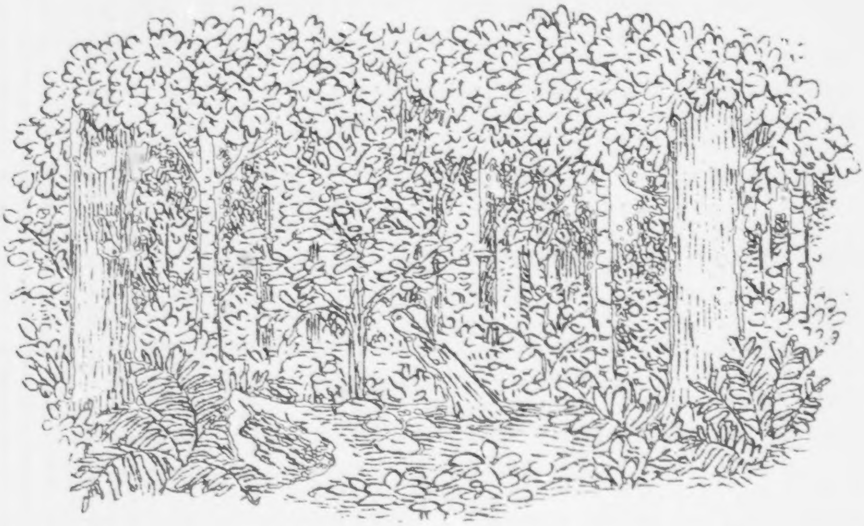
Before starting the research portion, prepare more simplified research materials such as labeled pictures of animals in their habitat.

For Older Participants (Grade 7 and Up):

1. Introduce the activity as above, but add that the wildlife habitat will eventually include humans.

2. It is important that participants create a larger model in shipping boxes or on pieces of foam core board, as discussed in Step 7, above.

3. Once participants have created their habitat, tell them that they must make room for a small human development. The humans must have food (a grocery store or a garden), water (a well or a public drinking water system), cover (houses), and places to raise young (houses will cover this, but a school may be added). Participants must also design roads for the people to travel to work. Tell participants to make this community keeping in mind that they must try to address the needs of animals AND people, and therefore must attempt to conserve wildlife habitat.



Questions:

- What are some basic similarities between different wildlife habitats?
- How do basic needs differ from animal to animal?
- How are habitat requirements of animals outside the local area different than those of local animals?

Adaptations:

Please refer to general adaptations on pages 11-16.

Hearing Disabilities:

- Use pictures to illustrate different

types of habitats (e.g., forest, desert, coastal, etc.) and the four key elements of habitat. Use hands-on examples if available.

- Encourage participants to actively participate in the discussion and group work. Have participants who have difficulty speaking and their group members write things down when working to create their habitats.
- Allow participants to use the sign language interpreter to give their presentations to the group as needed.

Learning/Cognitive Disabilities:

- Use pictures to illustrate different types of habitats (e.g., forest, desert, coastal, etc.) and the four key elements of habitat. Use hands-on examples if available.
- If desired, provide pictures of several animals and have participants choose the animal they are interested in.
- Have a variety of reference materials available, including picture books and recorded materials for individuals who have difficulty reading.
- Have tape recorders available for participants who have difficulty writing. An alternative to the worksheet is to have participants create a poster for their animal by drawing the four key elements of its habitat or cutting pictures out of magazines. The poster can be used to help with the oral presentation.

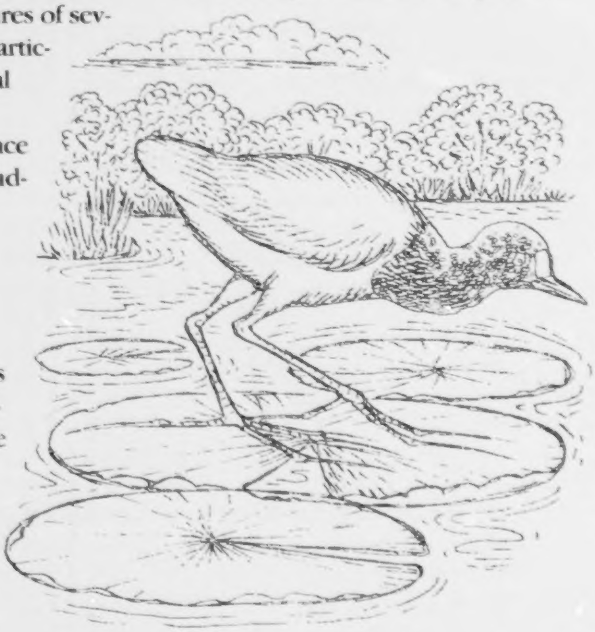
Motor Disabilities:

For the outside portion:

- Choose a largely accessible site (e.g., level, no standing water, etc.) for collecting.
- Provide bags with handles for collecting items.
- Encourage the use of adaptive equipment such as reachers for collecting items. Have partners assist as needed.

For participants with limited muscle strength, coordination, or dexterity of the hands:

- Have adaptive scissors and large glue sticks available.
- Provide tape recorders for participants who have difficulty writing.
- Encourage participants who have difficulty writing to give the oral presentation.



Visual Disabilities:

Overall:

- Briefly review habitat elements and use hands-on examples to illustrate each.
- Have reference materials available in alternate formats such as Braille, large print, and/or recorded materials.
- Have participants feel the dimensions of the box or foam tray before starting the assembly process. Encourage partners to verbally guide participants through the assembly steps of the habitat model.

For participants who are blind:

- Have participants use their own writing equipment, have a Braille writer available, and/or provide small tape recorders for individuals to use. Have participants dictate information to partners as needed.

For participants with low vision:

- Use a piece of white foam board as the base of the model.
- Have a variety of magnifiers available.

For the outside portion:

- Give participants a bag with handles for collecting.
- Encourage partners to actively guide the participant through the collection process.

WORKSHEET

Designing Wildlife Habitats

1. We're finding habitat for this animal: ____________________

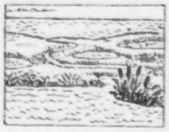
2. Region or ecosystem where our animal is found: ____________________

____

3. Habitat needs for the animal:

FOOD: ____________________

____



WATER: ____________________

____

COVER: ____________________

____

PLACES TO RAISE YOUNG: ____________________

____

4. Other plants and animals that might live nearby:

____

____

5. Other interesting facts: ____________________

____

Nature Scavenger Hunt

ACTIVITY 4

Summary:
Participants search for interesting natural objects in a familiar place.

Grade Level:
3-6

Time:
1 hour

Learning Objectives:
Participants will be able to:
- ◇ Discover plants, animals, and other elements in a local habitat.
- ◇ Practice appropriate collection methods.
- ◇ Improve observation skills.

Materials Needed:
- ◇ Copies of the Nature Scavenger Hunt worksheet
- ◇ Pencils
- ◇ Clipboards

Background:

Every area has its own set of characteristics. If participants study their area closely, they will discover all sorts of interesting signs of life. This is true even in the most unlikely places, including backyards, parking lots, and school playgrounds.

All living things need a habitat, or a place to live. Habitat provides all the basic needs, which for animals include food, water, cover, and places to raise young. Some organisms have very specific requirements for their habitat. Black bears, for instance, need a lot of undisturbed space in which to live. Other plants and animals are very adaptable and can tolerate many different environments. Dandelions, for example, can be found in a backyard, a grassy field, or growing out of cracks in the sidewalk. Occasionally, the adaptability of some animals may surprise even biologists. Peregrine falcons, for instance, have adapted to urban life in some cities, choosing roosts high among the building tops.

What to Do:

1. Prior to the start of this activity, scope out the surrounding area and choose clear boundaries for the group to explore.

2. Ask, *Would you like to explore your habitat? What do you think you'll find?* Ask participants to think about what kinds of habitat-related items they will find if they walk around and observe carefully. *What kinds of questions do they have about their local habitat?* Generate a list on a board.

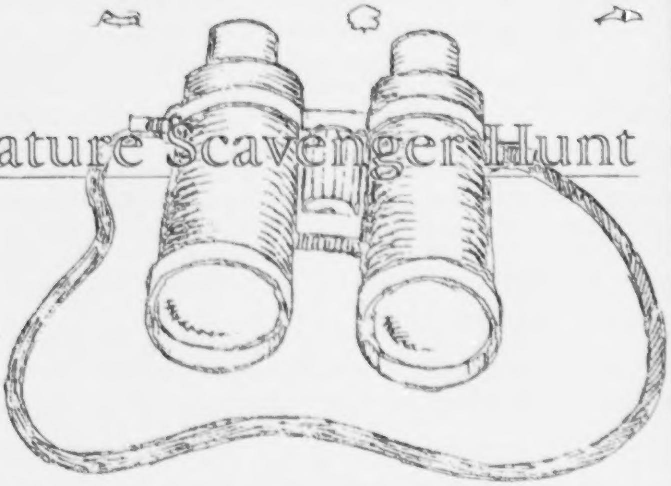
3. Break participants into teams of 2-5 people, depending on the group's size. If possible, have a volunteer oversee each small group.

4. Distribute the Nature Scavenger Hunt worksheet and pencils, and review the directions and boundaries with them. Make sure to review appropriate collection techniques and safety considerations (pages 17-18).

5. Give the teams a set amount of time (30-40 minutes) to complete their scavenger hunt (prize incentives can be used, if desired).

6. When all the teams return, review what they found and where they found it. Discuss with them the role that each item plays in the habitat. Ask them if they discovered anything surprising. *Did they find answers to any of their questions? If not, what kinds of explorations might they embark on next?*

7. After the discussion, ask the teams to return the items they collected to the different places that they found them. Discuss why it



is important to minimize our disturbance of the area, so that every item can be used by the plants and animals that need it.

For Younger Participants (Grades K-2):

It is important to pair up younger participants with adults or responsible youth volunteers. If pairs are not feasible, keep the ratio of volunteers to participants as low as possible.

For Older Participants (Grade 7 and Up):

Have participants pair up, and after they have walked around the area where the search is to take place, have each person develop and write down their own 15-item scavenger hunt list. Once completed, partners should trade papers and try to find the items on his or her partner's list. They may wish to use the worksheet as a guide.

Questions:

- What role does each item play in the area in which it was found?
- Why are some organisms or other objects easier to find than others?
- Why is it surprising to find certain items in this area?

Adaptations:

Please refer to general adaptations on pages 11-16.

Hearing Disabilities:

- Have examples of items from the worksheet for participants to see and touch.
- Position yourself and the interpreter so the participants can see you for further directions or warnings while on the trail.
- Clearly mark the trail with a beginning and an end point (use string or flags).
- Have a set meeting place on the trail in case anyone gets lost.

Learning/Cognitive Disabilities:

- Have examples of items from the worksheet for participants to see and touch.
- Clearly mark the trail with a beginning and an end point (use string or flags).
- Include items that can be heard (birds or running water), felt (tree bark or moss), and smelled (flowers or soil). Have partners assist with identifying these items by name.
- Have participants who have difficulty writing draw pictures of locations/items, or provide small tape recorders. Encourage them to make a mark next to an item once it has been found.
- Have partners assist with reading and identification as needed.
- Encourage partners to actively engage the participant in the collection process.
- Have a set meeting place on the trail in case anyone gets lost.

Motor Disabilities:

Overall:

- Select a site that is largely accessible (e.g., level, no standing water, etc.) for the hunt.
- Provide bags with handles that can be attached to wheelchairs or walkers for collecting.
- Encourage the use of any necessary adaptive equipment (e.g., reachers) to pick up items.

For participants with limited muscle strength, coordination, or dexterity of the hands:

- Provide a clipboard for the collection sheet.
- Build up pencils with foam, tape, or adhesive bandage material as needed. Have partners assist those who have difficulty writing to mark the collection sheet.

Visual Disabilities:

Overall:

- Have touchable examples of items from the list.
- Include items that can be heard (birds or running water), felt (tree

Nature Scavenger Hunt

ACTIVITY 4

bark or moss), and smelled (flowers or soil). Have partners assist with identifying these items by name.

- Encourage partners to actively engage participants in this activity using vivid descriptions, pointing out things to been touched, heard, and smelled.
- Have the partners of participants who are blind hold the list so participants can have a free hand to explore with.
- Clearly mark a trail with a guide string on one side.
- Provide the list of items in large print and Braille.
- Provide small tape recorders for participants to record their findings if they do not have a method of writing available to them.

WORKSHEET

Nature Scavenger Hunt

DIRECTIONS: With your partner, try to find each of the items listed below. If the item has the word "collect" next to it, you may put the item into your bag. If the item has the words "describe and note location" next to it, write where you found the item, but do not remove it!

1. A blade of grass longer than your index finger (collect)
2. An acorn cap (collect)
3. A leaf on the ground (collect)
4. A pine cone (collect)
5. A few pine needles (collect)
6. A twig longer than your thumb (collect)
7. Moss on the side of a building (describe and note location)
8. Fungi (describe and note location)
9. Signs of a spider or a spider itself (describe and note location)
10. An ant hill (describe and note location)
11. Plants or insects in a sidewalk crack (describe and note location)
12. Signs of birds or birds themselves (describe and note location)
13. Signs of amphibians or reptiles or the animals themselves (describe and note location)
14. Signs of mice, squirrels or other small animals or the animals themselves (describe and note location)
15. Signs of larger mammals or the mammals themselves (describe and note location)
16. Two different kinds of seeds (collect)

Habitats for Sale

ACTIVITY 5

Summary:

Participants write classified ads for animal habitats.

Grade Level:

K-7

Time:

1 hour 30 minutes

Learning Objectives:

Participants will be able to:

- ◇ Understand the concept of habitat and what living things need to survive.
- ◇ Creatively imagine and describe different habitats for different animals.
- ◇ Describe several ways living things adapt to their habitats.

Materials Needed:

- ◇ Reference books and resources on animals and animal pictures
- ◇ Pictures of different ecosystems (e.g., grasslands, coastal, forest, etc.)
- ◇ Paper and pencils
- ◇ Crayons/markers
- ◇ Real estate ads from local newspaper
- ◇ The outside version requires access to the outdoors, and natural materials (e.g., leaves, branches, pines cones) that participants can use to create an imaginative habitat.

For Younger Participants (K-2):

- ◇ Bulletin board supplies
- ◇ Tempera paints and brushes
- ◇ Construction paper
- ◇ Markers, crayons or colored pencils
- ◇ Pictures of animals
- ◇ Tape

Background:

An animal's **habitat** is the place in which it lives. In that place, an animal must be able to find food, water, cover, and a place to raise young. In some urban and suburban settings, commercial and residential development may disturb habitats to the point where animals can no longer meet these basic needs.

Habitat loss is the greatest threat to **biodiversity**, the variety of living things in a given area. Generally, an area that has a great deal of biological diversity will produce more goods (fruits, nuts, vegetables, lumber, etc.) and will be more resilient in the face of a natural disaster (disease, floods, etc.). A decline in biodiversity leaves an ecosystem depleted, unbalanced, and may eventually prevent it from functioning properly.

***Note:** This activity has both an indoor and an outdoor version.*

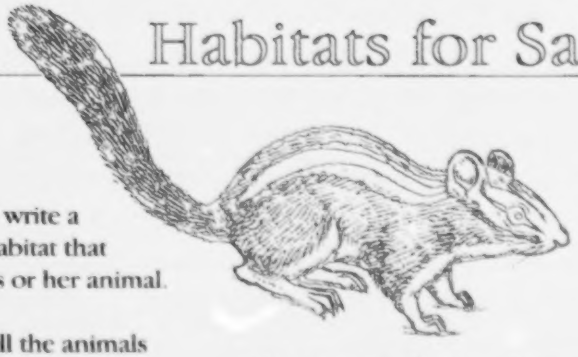
What to Do:

1. If the group is not familiar with the concept of habitat, introduce the word "habitat." Explain that an **animal's habitat provides the food, water, cover and space it needs to** survive and raise young.

2. Brainstorm the names of different ecosystems (e.g., fields, forests, oceans, deserts, streams or rain forests) and animals that live in each ecosystem. Discuss how animals build special homes as a part of their habitats (e.g., beaver lodges, bird nests, and fox dens). These homes provide cover from weather, protection from predators and places to raise young. Point out that many animals—such as lions, fish and deer—do not build special homes but may use habitat features already there.

3. Tell participants that they will be playing a guessing game and then creating their own game—trying to find out which animals would like to live in several different habitats. Show pictures and read a few sample real estate ads from a newspaper to give participants an idea of what they will be creating. Read these make-believe examples and ask them to guess which animals might answer each ad.

- **Great Grasslands**: Prime grassland available in Africa. Loaded with antelope, springboks, zebras and other tasty prey. Close to



refreshing water holes and shady clumps of acacia trees. Lots of wide-open territory. Great for new pride. Call before this great buy is snatched up. (Answer: Lion)

- **Underground Castle:** Lots of tunnels available in the Smith family's backyard. Home to juicy earthworms and other tasty creatures. Loose, moist soil for easy tunneling and no pesky cats in the neighborhood. This super backyard buy is available immediately. (Answer: Mole)

4. Explain to participants that they will create a classified ad that describes an animal's habitat and/or home. Write animal names on slips of paper or find pictures of animals (examples: squirrel, hedgehog, orangutan, vampire bat, bison, rat, blue whale, snake, owl, leopard, dolphin, duck, weasel, camel, wart hog, black bear, fox, prairie chicken, penguin, elephant, trout, woodpecker, earthworm, spider, eagle, wolf, cricket, crab).

5. Have each person (or groups of 2-3) choose a slip of paper or picture and then create a classified ad that includes a description of where the animal finds food, water, cover and a place for raising young, without giving away the identity of the animal. They may write the ad and supply it with a drawing of the animal in its habitat. Provide reference books and resources. Ask each person or group to write a classified ad for a habitat that would appeal to his or her animal.

6. Display a list of all the animals chosen for participants to see. Ask participants to take turns reading their classified ads aloud to the group. The group then guesses which animal goes with which ad. Discuss how some ads might fit more than one animal and how some animals might adapt to fit into a habitat that is not their ideal home.

7. After everyone has had their turn, have participants draw the habitat he or she wrote about, including the animal. You may want to post these drawings in a prominent place.

Outside Version:

1. Instead of creating a written classified ad, ask each person to select an animal. After everyone researches his/her animal's needs, take the group outside to collect items (leaves, sticks, grass, sand) that are part of their animal's habitat. If possible, have volunteers oversee small groups. Review appropriate collection techniques and safety considerations (pages 17-18).

2. Once they find appropriate materials, ask participants to use their imaginations and the materials they have collected (e.g., a pile of rocks with a space under it could represent a cave) to create a demonstration habitat for that animal.

3. Have each person explain the habitat and ask the group to guess which animal(s) could live in it. Discuss how some habitats might fit more than one animal and how some animals might adapt to fit into a habitat that is not their ideal home.

For Younger Participants (K-2):

Create a large tree on a bulletin board or felt board. Have participants paint the trunk, background, and leaves, and/or cut out construction paper leaves. Provide each person (or small teams) with at least one picture of an animal that lives in or around a tree. (e.g., robin, owl, squirrel, chipmunk, ant, fox, porcupine, bat, spider, cardinal, tree frog/toad) Have participants color and cut out their animals and add them to the area in or around the tree where they think the animal lives.

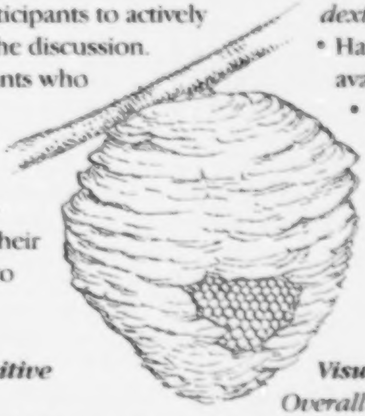
For each animal, review what it would eat, where it would find water, cover, and whether the tree provides adequate space for it to live. Ask the group if they also want to add other things to the bulletin board to create a better habitat for the animals there (e.g., a stream or pond, or other trees). Mention that some homes in and around the tree might fit more than one animal and how some animals might adapt to fit into a habitat that is not their ideal home (i.e., a raccoon in an urban/suburban area).

Adaptations:

Refer to general adaptations on pages 11-16.

Hearing Disabilities:

- Encourage participants to actively participate in the discussion. Allow participants who have difficulty speaking to use the sign language interpreter to give their presentations to the group.



Learning/Cognitive Disabilities:

- Have a variety of reference materials available, including picture books and recorded materials for individuals who have difficulty reading.
- Have tape recorders available for participants who have difficulty writing to create their ad text or allow participants to create a habitat poster for their animal and explain it to the group.
- Provide pictures of all the animals represented in the group along with the names for individuals who have difficulty reading (Step 6).

Motor Disabilities:

For the outside option:

- Choose a largely accessible site.
- Provide bags with handles for collecting items.
- Encourage the use of adaptive equipment such as reachers for collecting items.

For participants with limited muscle strength, coordination, or dexterity of the hands:

- Have adaptive scissors available.
- Have glue sticks available.
- Provide tape recorders for participants who have difficulty writing to record their ad information or have them do an oral report.

Visual Disabilities:

Overall:

- Use touchable examples to illustrate habitat components.
- Have reference materials available in alternate formats such as Braille, large print, and/or recorded materials.
- Have participants use their own writing equipment, have a Braille writer available, and/or provide small tape recorders for individuals to use to create the text for their ads.
- Have participants who have difficulty drawing make a clay sculpture of their animal (Step 7).

For participants with low vision:

- Provide drawing paper and thick black markers for participants to use to complete their ads.
- Provide a variety of magnifiers.

For the outside version:

- Provide bags with handles for collecting items.
- Encourage partners to actively guide the participant through the collection process and avoid doing this part of the activity for them.

For the K-2 version:

- Have participants who are blind make animals out of pom-poms, pipe-cleaners, feathers, or clay instead of coloring pictures. Have pre-cut leaves or tissue paper available for participants to place on the living tree.

ACTIVITY
6

Wildlife Observation Hike

Summary:
Participants hone their observation skills outside.

Grade Level:
1-8

Time:
1 hour

Learning Objectives:
Participants will be able to:
◇ Observe wildlife and signs of wildlife.
◇ Collect scientific data.
◇ Identify and categorize wildlife.

Materials Needed:
◇ Copies of the Wildlife Observation Checklist
◇ Pencils
◇ Clipboards, if available
◇ Plant and animal field guides, if available
◇ Magnifying glasses, if available

Background:

It often comes as a surprise how much wildlife we can find if we take the time to investigate a nearby park, forest or schoolyard. Typically, participants will find animals and plants in many different categories. Below is a very basic description of some of the categories of animals and plants that a participant may find in his/her environment.

- **Mammals** are **endothermic**, meaning they produce their own body heat. They are **vertebrates** (they have backbones), have hair on their skin, and mothers feed their young milk. Some examples of mammal homes include messy-looking nests in trees (squirrels) and burrows (woodchucks). Mammals usually have relatively solid scat,or feces (especially plant eaters), in pellets or large pieces.

- **Birds** are endothermic vertebrates that lay eggs. They have feathers and wings, hollow bones (to be light), and most can fly. Often birds' distinctive calls can be heard before they are spotted. They usually have well-constructed nests. Look for their not-so-solid, white or green/brown scat on sidewalks, on buildings, near nests, etc.

- **Invertebrates** have no backbone, so any insect, spider, slug, crayfish, or worm will qualify. Many invertebrates, like ants and beetles, have an **exoskeleton**, or a hard shell, which protects their soft inner body parts. Look for homes on the ground and under logs or rocks (but be careful not to disturb them too much.)

- **Amphibians** are **ectothermic** animals, which means they depend on outside temperature factors to regulate their body temperature. They have backbones, and usually have moist skin, but no scales. Most live the first part of their lives in water, like tadpoles, then at least partially on land as adults (like frogs). Most adults have four legs. Look for gooey egg masses in or near water.

- **Reptiles** also are ectothermic, so they are inactive in cold weather. They have backbones (even snakes,) and dry, scaly skin. Some walk on four legs, some slither, and most lay leathery eggs.

- **Fish** are also ectothermic, but since water temperatures fluctuate less than air, they might be found swimming even in the winter. Many are **oviparous**, which means they produce eggs that hatch outside the body. All fish have backbones, and they usually have fins and a scaly body. Fish breathe through gills, and most spend almost all of their time in water.

- **Plants** need sunlight to make their food and produce oxygen through a process called **photosynthesis**. Therefore, they need solar collectors (leaves), and something to hold them down (roots) in the soil. Plants soak up and move water and nutrients throughout their systems.

- **Fungi** stay put as plants do, but unlike plants they do not use photosynthesis to make food. Stringy fibers called **filaments** make up the largest part of a fungus, but the part we usually see is a mushroom, a type of mold, or some kind of puffball. They spread the filaments where they live on old logs, on the ground, on other decaying food, on animal scat, and on decaying organic matter. They break down these materials and return nutrients to the soil.

- **Lichen** grows on rocks and trees, and has flat leaf-like growths that splay out in a rounded pattern. Lichens consist of a type of fungus and algae that live together in the same space.

- **Mosses** are plants, but sit next to fungus on the category list since they are not like the vascular plants with larger leaves and root structures, and since they tend to be found near fungus. Mosses are typically found on any moist, relatively shady side of a tree or rock. They use photosynthesis to make food and are usually greenish in color. They are usually soft and spongy.

- If a mystery item does not fit in any of the above categories, participants can put it in an "other" slot. Try to encourage participants to figure out to which category it belongs.

What to Do:

1. Ask, *Do you know how to observe?* Briefly discuss the importance of observation and data collection. Observation allows the participant to gather information in a non-biased way. Observations should be simple descriptions of what the observer sees, with as little interpretation as possible. (For example, encourage participants to report "One squirrel is following after another," rather than "The squirrels like each other and one is trying to catch the other.") This kind of straightforward data allows scientists (that is people who are curious about the way the world works) to learn from the natural world and discover new information about nature.

2. Inform participants they are to apply all the knowledge they have gained about habitat and wildlife through field study. Hand out the Wildlife Observation worksheet and review the plant and animal categories. Consider giving each team a copy of the background information on each of the categories for easy reference. As part of the field study, encourage participants to look for signs of wildlife as well as plants and animals. Examples of "signs of wildlife" include scat, webs, feathers, antler and claw rubbings on trees, and animal tracks. See page 255 for an additional list of wildlife clues.

3. Divide participants into teams of two or three. Review appropriate collection techniques and safety considerations (pages 17-18). Lead an observation hike and have the teams choose a spot along the hike to observe. If possible, have volunteers oversee these teams; with younger participants this is essential, as they will probably need assistance.

4. After about 30-45 minutes in the field, have participants regroup in a central outdoor area or in the classroom. Ask each team to report their

findings and present them to the group. *What did they discover? How do their findings differ from other teams? Why would that be? Do they have any further questions about what they saw?* Have each team write down a list of questions that this investigation brought up.

Questions:

- What signs of animals can you find?
- Why do you think animals are hard to find?
- What kinds of observations are easiest to make?

Adaptations:

Refer to general adaptations on pages 11-16.

Hearing Disabilities:

- Clearly mark the trail with a beginning and an end point (use string or flags).
- Have a set meeting place in case individuals get separated.
- Provide each team with a copy of the background information from this activity and the list of Wildlife Clues on page 255.
- Have all participants write down comments and input to facilitate effective communication in their small groups.
- Position yourself and the interpreter so the participants can see you for further directions or warnings while on the trail.
- Allow participants who have difficulty speaking to use the sign language interpreter to present their findings to the group.

Learning/Cognitive Disabilities:

- Review the contents of the list as needed.
- Have resources available in alternate formats including field guides with large color pictures.
- Provide small tape recorders for participants who have difficulty writing or have participants dictate information to a group recorder.
- Clearly mark the trail with a beginning and an end point (use string or flags).
- Have a set meeting place in case individuals get separated.
- Provide each team with a copy of the background information from this activity and the list of Wildlife Clues on page 255.

Motor Disabilities:

- Select a site that is largely accessible.

For participants with limited muscle strength, coordination, or dexterity of the hands:

- Provide clipboards.
- Build up the handles on pencils with foam, tape, putty, or bandage material as needed.
- Provide small tape recorders for those participants who have difficulty writing to record their information or have them dictate input to the group recorder.

Visual Disabilities:

Overall:

- Clearly mark the trail with a guide string on one side.
- Provide small tape recorders for participants to record their findings if they do not have a method of writing available to them or have participants dictate input to the group recorder.
- Have partners use vivid descriptions and encourage participants to touch and explore items to be observed.
- Focus on wildlife sounds and smells.
- Have resources available in alternate formats.

For participants with low vision:

- Create a large print version of the Wildlife Observation Checklist.
- Provide clipboards and thick black markers for use.
- Have a variety of magnifiers available.

For participants who are blind:

- Create a Braille version of the Wildlife Observation Checklist.

Wildlife Observation Hike

WORKSHEET

WILDLIFE OBSERVATION CHECKLIST

Date/Time:

Weather:

Team Members:

1. Describe the weather today: ______________________________

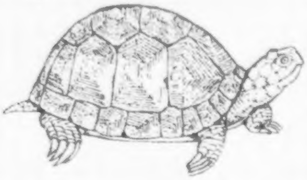
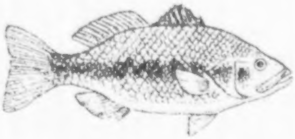
2. Describe the plot of land (habitat) you chose (include plant life, grass, firmness of soil, nearness to buildings, etc.): ______________________________

DIRECTIONS: Below are eight categories of plants and animals. For each different plant or animal you see (or signs of one), give one tally mark. Describe or draw a picture of it.

CATEGORY	TALLY MARKS	DESCRIPTION (size, color, location, behavior)
Example: Birds	///	1. Small brown bird with white beak; 2. Woodpeckers holes in tree; 3. Bird sat on ground
Mammals		
Birds		
Invertebrates (insects, slugs, spiders, etc.)		

WORKSHEET

Wildlife Observation Hike

CATEGORY	TALLY MARKS	DESCRIPTION (size, color, location, behavior)
Amphibians		
Reptiles 		
Fish 		
Plants		
Fungi/Moss		
Other		

72

Sun, Soil, and Water

SECTION 2

ACTIVITY
7

Photosynthesis Phun

Summary:
Participants explore plant needs with live plants.

Grade Level:
1-8

Time:
3 or more 30-minute sessions over four weeks

Learning Objectives:
Participants will be able to:

- Identify the four basic plant needs, and describe how each is important.
- Predict what would happen to plants lacking these needs.
- Formulate a hypothesis.
- Test hypotheses with live plants.

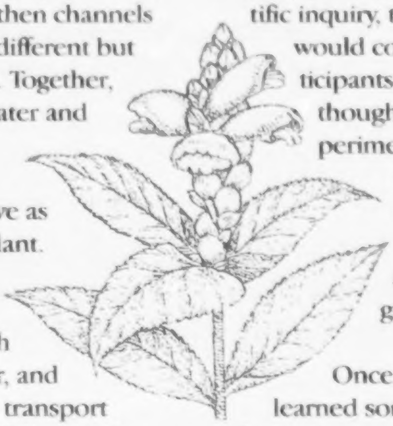
Materials Needed:

- Poster board, butcher paper, or dry-erase/chalkboard
- Markers, pencils and/or chalk
- 50 bean, pea, alfalfa, or sunflower seeds
- Paper towels
- Copies of both worksheets
- Approx. 20 containers for planting seedlings (2 egg cartons will do)
- A small bag of potting soil
- A gallon glass jar
- Colorful construction paper and glue, OR notebook paper, graph paper, and pencils
- Optional: several room plants for demonstration

Background:

In order to survive and grow, green plants need sunlight, water, soil, and carbon dioxide from the air. They need sunlight for the energy to convert water and carbon dioxide into the simple sugars they use for food. Water transports food and other nutrients, and with carbon dioxide, serves as important building material. Plants need soil to hold their roots in place and provide nutrients, such as nitrogen, to help with growth.

Green plants are called **primary producers** because they, unlike most other organisms, manufacture their own food. Plants do this in a process called **photosynthesis**. In photosynthesis, plant leaves act like solar panels to collect sunlight. A pigment called **chlorophyll** absorbs the energy collected, then channels this energy to power different but interrelated reactions. Together, these reactions use water and carbon dioxide to generate simple sugars, which in turn serve as food energy for the plant. Other by-products of photosynthesis include oxygen, which is released into the air, and water, which helps to transport nutrients to the rest of the plant.



There are certainly many other plant needs, including the right amount of space, special nutrient requirements, and certain conditions for plant reproduction and seed germination, but since these can all be highly variable from plant to plant, this activity focuses on the four basic needs above. Participants may be able to devise different experiments to explore these other plant needs.

This activity allows participants to explore the different needs of plants. It is also an inquiry-based activity, so in essence, it follows the scientific method. According to the scientific method, participants will begin this activity by making general observations (in this case, observations about plants). These observations are followed by questions raised by participants. In true scientific inquiry, these questions would come from the participants themselves, though to facilitate the experiment the instructor may suggest questions (e.g., *"What do plants need to survive?")* to the group.

Once participants have learned some background information regarding their ques-

Here is a simplified chemical equation for photosynthesis:
6 CO_2 (carbon dioxide) + 12 H_2O (water vapor) + Energy from the sun = C_6H_{12}O6 (sugar) + 6 H_2O (water) + O_2 (oxygen)

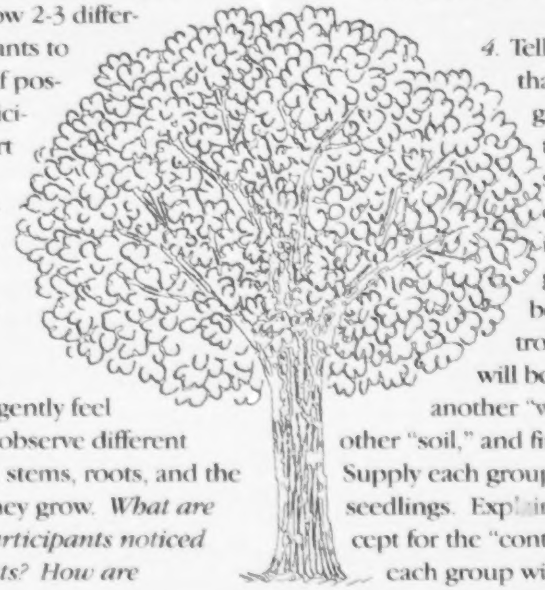
tions, they may formulate a plan as to how they might test out these ideas. Again, this activity deviates from the scientific method in that the basic plan for how to run the experiment has already been laid out. However, if you have the time, we encourage you to have participants come up with their own experiments from their questions.

Before they execute a plan, participants will form **hypotheses**; they will guess the outcome of their experiment based on background information available to them (e.g., "When we stop watering the plant it will stop growing, dry up, and die in two days."). After formulating and recording their hypotheses, they will perform the **experiment** (e.g., to test for sunlight, they might hide the plant away in a dark closet) and **collect data**. Finally, they will **analyze** the data, propose different answers based on their results and background, and write a **conclusion** about the results of the experiment. A conclusion compares the results of the experiment to the participant's hypotheses and suggests reasons why the two did or did not match. Often in science, a conclusion will wind up stimulating more questions than it answered.

What to Do:

Preparation: About three weeks before beginning the experiment portion of this activity, it is necessary to prepare about 50 bean, pea, or alfalfa seeds for planting. Have participants place the seeds in a clear container (a glass jar will do fine), on a bed of damp paper towels. It is important that the seeds stay moist and get enough sunlight, so keep them near a window and monitor the towels' moisture over the weeks. When roots and leaves begin to develop, the plants, called "seedlings" at this point, will be ready for planting. Have participants watch over the weeks as the seeds develop into seedlings.

1. When the seedlings are ready for planting, you are ready to start the activity. Show 2-3 different kinds of plants to the group, or, if possible, take participants on a short tour of a garden with many different kinds of plants. Ask participants to observe the plants closely. Allow them to gently feel and otherwise observe different types of leaves, stems, roots, and the soil in which they grow. *What are some things participants noticed about the plants? How are the plants alike? How are they different?*



2. Ask participants, *What elements do plants need to survive?* Make a list of answers on a chalkboard or a piece of butcher paper. Talk about each one briefly. Participants should understand that all plants need sunlight, water, soil, and air to survive. *How do they know these things are true? How could they test whether these are truly basic needs or not?* Brainstorm and discuss some of their ideas.

3. Tell them that for the experiment, they will test the importance of each basic plant need by depriving some of the plants of those needs. Ask participants, *What would happen to a plant that was given no sunlight? What about air? Water? Soil?*

4. Tell participants that each group will take care of a specific part of the experiment. One group will be the "control," another will be "light," another "water," another "soil," and finally, "air." Supply each group with four seedlings. Explain that, except for the "control" group, each group will test the

importance of a different plant need by depriving the plant of one such need (e.g., sunlight) and noting the effects. The group called "control" will give their plants all basic plant needs, so that the others can compare their plants with a healthy one. If possible, have volunteers oversee small groups.

5. Hand out the data collection sheet and ask each group to come up with a hypothesis as to what will happen to their particular plants over the next four weeks. Have them write down their ideas on the worksheet, and to be as specific as they can. For example, the soil group might write, "We think that since the seedlings survived without soil, and since plants only need soil to hold their roots, the plants will grow normally but might not be able to stand as tall." It is important to note that a hypothesis does not have to be correct; the point of the experiment is to test out participants' ideas. A hypothesis should, however, have some basis in what participants may already know or have learned in group discussion or research.

6. Give the following instructions to the five different groups. If participants come up with different plant needs, (e.g., a certain amount of space, a certain type of soil, unpolluted water, just the right amount of water), or if testing all four different plant needs is not workable, tailor the activity accordingly.

- Have the control group plant their four seedlings in four small cups filled with potting soil (they can use four parts of an egg carton for this). Have them label the cups "Control," and place them in a well-lit area (in sunlight or under a grow lamp). Participants should water the plants just enough so that the soil remains moist.
- The group testing for sunlight should plant their seedlings in four similar cups, label them with the word "Light," and circle the word and put a slash mark through it. Have the group cover the plants loosely with a dark cloth or place them in a dark closet. Have participants water the plants as the control group above.
- The water group should do everything the control group did (plant seedlings in soil, keep in a well-lit area), except water the plant. They should label their plants "Water," then circle the word and put a slash mark through it.
- To test for the effects of a lack of soil, participants in the soil group should place seedlings in small containers, but instead of soil they should use damp paper towels. Participants should label these plants "Soil" with a slash mark through it. They should keep the plants in a well-lit area and keep the paper towels moist.
- Finally, have the air group plant their seedlings in four small cups with a good amount of potting soil. Have them place the cups in a large-mouthed, clear jar that has a good seal on it. This group should water the plants as needed, and label the plants "Air" with a slash through it.

Note: *It is very likely that the "air" experiment will produce healthy plants. This is largely because of a process called respiration, in which energy stored by photosynthesis is released. In this process, simple sugars react with oxygen to create carbon dioxide and water. This is the reverse of photosynthesis, so it is conceivable that a plant in an "air-tight" jar will recycle its byproducts from one process to the next and essentially reuse its own air. It is also unlikely participants will be able to create a truly airless environment, though they may have some ideas after the experiment. Encourage participants to suggest reasons their plants did or did not do well in this environment.*

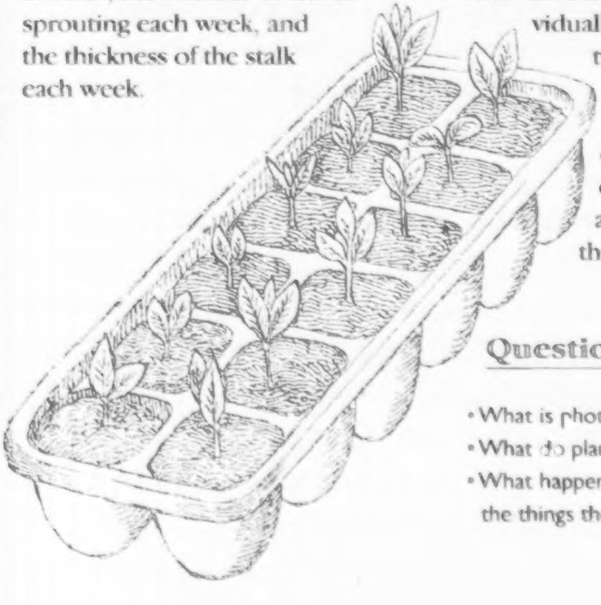
7. Have each group measure their plants on the first day and record this initial measurement. They should measure height, color, number of leaves present, and thickness of the stalk.

8. As time passes, have each group make observations of their plants. Each week, ask groups to measure the height of the plants with a ruler or with a strip of colorful construction paper. Younger participants

Photosynthesis Phun

ACTIVITY 7

(i.e., 3rd grade and below) may need to use the construction paper, and should use different colors each time they measure. To show their results, younger participants should create bar graphs with the different colored strips of paper, each color representing a different day. On the other hand, participants measuring plants with rulers should record their data on the data collection sheet provided below. By recording data, they can later create graphs on graph paper, with inches on the left-hand (vertical) axis and time in weeks on the lower (horizontal) axis. Other observations include plant growth rate, which participants can figure by dividing how much the plant has grown by the number of weeks passed. Also, have them observe any change in color, the number of leaves sprouting each week, and the thickness of the stalk each week.



9. At the end of the set growing period (four weeks or so), discuss with all the participants what they discovered. Ask each group to show how their plants grew over time. Discuss which plants grew the most, which did not grow as much, and any other differences between the plants. Have participants revisit their hypotheses and check and see how they match with what happened. Have them write up a conclusion on their worksheets. Wrap up with a review of the different things plants need to survive.

For Older Participants (Grades 7 and Up):

Have participants work in pairs to test one of the conditions AND have their own control, individually comparing results between the two plants. After the initial experiment, ask them to come up with additional questions and design an experiment to test these questions.

Questions:

- What is photosynthesis?
- What do plants need to grow?
- What happens if they do not have one of the things they need?

Adaptations:

Refer to general adaptations on pages 11-16.

Hearing Disabilities:

- Make a poster depicting photosynthesis to illustrate the process.
- Use hands-on examples to illustrate plant needs. Suggestions: a squirt bottle of water for water, a fan for air, a grow lamp for sunlight, and a soil sample for soil. Encourage participants to experience each of the plant needs. You may also go outside and view/discuss representations of each need.
- If desired, use different colored blocks to help illustrate the chemical breakdown of photosynthesis (e.g., red = carbon dioxide, etc.). Have participants create the chemical chain with blocks to help illustrate the concept.

Learning/Cognitive Disabilities:

- Make a poster depicting photosynthesis to illustrate the process. Use minimal text on the poster as appropriate.
- Use hands-on examples to illustrate plant needs. Suggestions: a squirt bottle of water, a fan for air, a grow lamp for sunlight, and a soil sample for soil. Encourage participants to experience each of the plant need samples. You may also go outside and view/discuss natural representations of each plant need.
- As appropriate, use different col-

77

ored blocks to help illustrate the chemical breakdown of photosynthesis (e.g., red = carbon dioxide, etc.). Simplify as needed. Assist participants in creating the chemical chain with blocks to help illustrate the concept.

- Have pre-printed plant group labels available for participants who have difficulty writing.
- Provide a small tape recorder for participants who have difficulty writing to track their plants' progress or have a partner assist with completing the worksheet.
- Consider taking instant photographs and having them create a photo journal of the experiment.
- Have participants make a bar graph using strips of colored paper to chart plant growth. Have partners assist as needed.

Motor Disabilities:
Overall:

- Make sure plants are kept in an accessible spot for participants who use wheelchairs.

For participants with limited muscle strength, coordination, or dexterity of the hands:

- Use an ice cream scoop or build up the handle on a spoon with tape or foam for planting.
- Use beans or larger seeds that are easier to handle. Have partners assist as needed.
- Put a piece of no-slip material down under the plant containers when working for participants with spasticity. You may also use clay to attach plant containers to the work surface.
- Have pre-printed plant group labels available for participants who have difficulty writing.
- Have participants use a turkey baster or spray bottle to water their plants as needed.
- Have participants make a bar graph using strips of colored paper to chart plant growth. Have adaptive scissors available to cut the strips. Have partners assist as needed.
- Consider taking instant photographs and having them create a photo journal of the experiment.

Visual Disabilities:
Overall:

- Use beans or larger seeds that are easier to handle.
- Have partners verbally guide participants through planting, measuring, and collecting data as needed.
- Use hands-on examples to illustrate plant needs. Suggestions: a squirt bottle of water, a fan for air, a grow lamp for sunlight, and a soil sample for soil.
- Encourage participants to experience each of the plant need samples. You may also go outside and view/discuss natural representations of each plant need.
- Make a tactile poster of photosynthesis using different fabrics. Label poster in large print and Braille. Encourage participants to explore the poster.
- Have participants make a bar graph using strips of heavy paper or fabric to chart plant growth. Have partners assist as needed.

For participants with low vision:

- Have a large print version of the worksheets. Provide thick black markers to use.
- Use the largest ruler you can find. Mark the ruler with raised glue dots at every inch to help participants measure correctly.

For participants who are blind:

- Have a Braille version of the worksheets available.
- If possible, have Braille rulers available. You can also mark a ruler with large raised glue dots at every inch and smaller glue dots at every half-inch to help participants measure correctly. Have partners assist as needed.

Photosynthesis Phun

WORKSHEET

Plant group title (e.g., "control," "air," "soil," "water"): ______________________________

Method (How did you run your experiment?):

Group hypothesis (i.e., an educated guess as to what is going to happen to the plants for the next 4 weeks):

Conclusion (What happened in the end? How well did the results match up with your hypothesis?):

DATA COLLECTION SHEET

Data for:	Week 1	Week 2	Week 3	Week 4
Plant Height (in cm)				
Plant Growth Rate (in cm)				
Plant Color (describe as closely as possible, and especially note changes in color from week to week)				
Number of Leaf Sprouts				
Thickness of Plant (in cm, use decimal if less than 1 cm)				

Taking Earth's Temperature

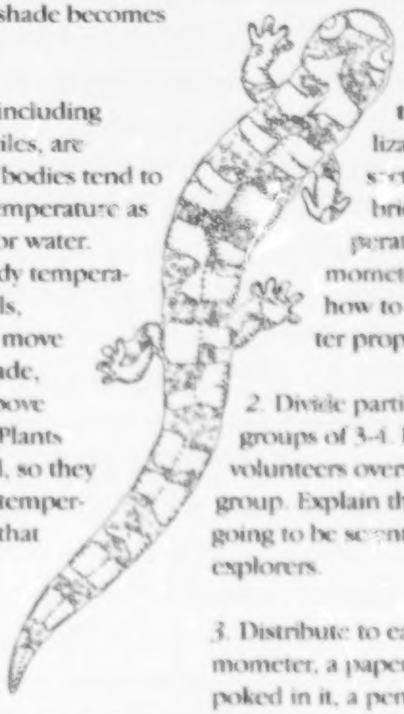
ACTIVITY 8

Background:

Birds and mammals (including humans) are **endothermic**. That means our bodies create their own heat. So our body temperature remains roughly the same whatever the air temperature. In cold weather, fat, fur, feathers and clothing keep heat from escaping faster than our bodies can make it. For mammals and birds in really hot, sunny weather, shade becomes very important.

Most other animals, including amphibians and reptiles, are **ectothermic**. Their bodies tend to be about the same temperature as the surrounding air or water. To maintain their body temperature at tolerable levels, ectothermic animals move between sun and shade, land and water, or above and below ground. Plants cannot move around, so they tend to grow where temperatures stay at a level that is good for them. If plants had blood, they'd be considered ectothermic.

It is obvious that summers are hot and winters are cold, but temperatures can vary considerably across the hours of a day and from spot to spot. This variance of temperatures can greatly affect the types of plants and animals living in a given area.



What to Do:

1. Ask participants, *What effect does temperature have on you? Do you like it hot? Cold? Why?* Brainstorm briefly with participants about the effect temperature has on themselves, food, animals, and water. Introduce the definitions of ectothermic and endothermic. Have participants give examples from each category (e.g., **endothermic**: bears, cats, different birds; **ectothermic**: frogs, lizards, snakes, insects). If necessary, briefly discuss temperature and thermometers, demonstrate how to use a thermometer properly.

2. Divide participants into groups of 3-4. If possible, have volunteers oversee each small group. Explain that each group is going to be scientific temperature explorers.

3. Distribute to each group: a thermometer, a paper cup with hole poked in it, a pencil, and 2 copies of the Data Collection Sheet. Have students examine their worksheets and make predictions about what kinds of temperature differences they will find. On one copy of the worksheet, participants should write down group hypotheses

***Note:** The following two activities are quite similar, each with a slightly different emphasis. You will probably want to choose one or the other, depending on your location.*

Summary:

Participants explore variations in temperature.

Grade Level:

3-8

Time:

1 hour

Learning Objectives:

Participants will be able to:

- Collect surface, air, and water temperature data.
- Define the terms endothermic and ectothermic.
- Practice proper surface, air, and water temperature collection.
- Draw inferences and conclusions based on the different temperatures taken and organisms that may live there.

Materials Needed:

- An air-and-water-temperature thermometer for each group. *Note:* 1) Do not use a body-temperature thermometer. It won't read low enough or high enough. 2) Try to use alcohol thermometers rather than mercury thermometers.
- Copies of the Data Collection Sheet
- Paper cups with one tiny hole carefully poked into the center of each cup's bottom
- Pencils

about which temperatures will be higher and lower compared to others in each row and column. Exact number predictions are not necessary. Leave this copy of the worksheet behind when groups go out to take their measurements.

4. Review the data collection instructions; include a definition of shade (complete lack of sun exposure) and partial shade (some areas with sunlight) if needed. Lead groups outside to collect data. Give them 20-30 minutes to complete the task, depending on the group's age level and distance they have to walk to collect the information.

5. When everyone is finished collecting data, gather the group together and discuss the different temperatures they discovered: ***Where was it coldest? Warmest? How did moisture and dryness affect the temperature? What were noticeable differences among the air, water, and surface temperatures? How did each group's findings differ from their hypotheses?*** Based on the group's findings, discuss which type of animals and plants may live where and why.

Note: *Review proper collection and safety techniques (see pages 17-18).*

For Younger Participants (Grades 1-2):

Have participants work in small groups. Give each group a thermometer and have groups together measure temperature in 5 different places in sun and shade (2 measurements for each): soil, moving water, still water, air, ground covered with asphalt or cement. Groups should record their findings on a large blackboard or flipchart and compare. ***What did they find? Why are some places warmer or cooler than others?***

Questions:

- What does it mean to be endothermic or ectothermic?
- How does temperature change from air, water, and land?
- How might temperature differences affect animals and plants?

Adaptations:

Refer to general adaptations on pages 11-16.

Hearing Disabilities:

- Have a set meeting place in case individuals get separated.
- Clearly mark the areas (use string or flags).
- Demonstrate how to use the thermometer and how to take the different types of temperatures. Have participants practice.
- Have all participants write down comments and input to facilitate effective communication in their small groups.
- Position yourself and the sign language interpreter so the participants can see you for further directions or warnings while on the trail/at the site.

Learning/Cognitive Disabilities:

- Have a set meeting place in case individuals get separated.
- Clearly mark the areas (use string or flags).
- Use the largest thermometer you can find. Demonstrate how to use the thermometer and how to take

the different types of temperatures. Have participants practice.

- If appropriate, complete the younger student version of the activity.

Motor Disabilities:

Overall:

- Select a site that is largely accessible.

For participants with limited muscle strength, coordination, or dexterity of the hands:

- Provide clipboards.
- Use the largest thermometer you can find. Provide test tube clamps for participants who are unable to hold the thermometer. Build up the handles of the clamps with tape as needed.

Visual Disabilities:

Overall:

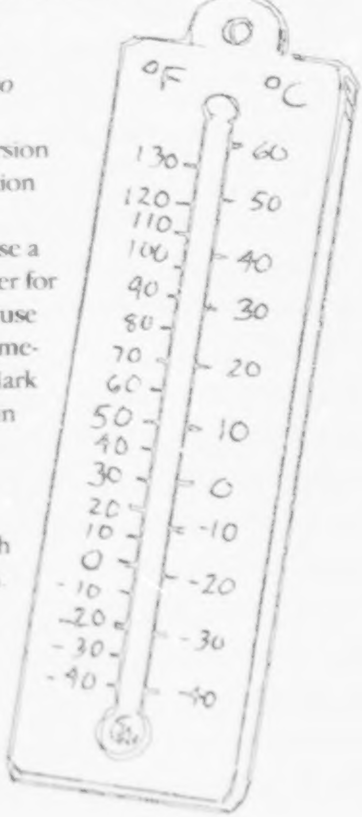
- Clearly mark the areas with a guide string on one side.
- Provide small tape recorders for participants to record their findings if they do not have a method of writing available to them. Alternately, have participants dictate input to the group recorder.
- Demonstrate how to use the thermometer and how to take the different types of temperatures. Have participants practice this skill.
- Have partners use vivid descriptions and to encourage participants to touch and explore items to be observed; insure that participants are fully engaged in the activity.

For participants with low vision:

- Create a large print version of the Data Collection Sheet. Provide thick black markers and clipboards for use.
- Use the largest thermometer you can find. Mark number increments with a black marker for easier viewing.

For participants who are blind:

- Create a Braille version of the Data Collection Sheet.
- If possible, purchase a Braille thermometer for this activity. If not, use the largest thermometer you can find. Mark every ten degrees in Braille, every five degree with tape, and place a single dot of glue for each degree in between. Have partners assist with the reading of the thermometer as needed.



BEST COPY AVAILABLE

WORKSHEET

Taking Earth's Temperature

DATA COLLECTION SHEET

Water and Subsurface Temperatures:

DIRECTIONS: Use the thermometer alone to check air, water and subsurface temperatures. (Be gentle when pushing the thermometer into soils, sand or gravel.)

	Open air	Inside box	Still water	Moving water	Dry sand	Wet sand	Loose soil	Soft mud	Small gravel	Grassy lawn	Dense weeds
SUN											
PARTIAL SHADE											
SHADE											

Surface Temperatures:

DIRECTIONS: Push the thermometer through the hole in the cup and use as a thermometer stand to check these surface temperatures.

	Hard soil	Hard mud	Dry sand	Wet sand	Hard clay	Ice on ground	Ice on water	Frosty ground	Tree trunk	Your skin
SUN										
PARTIAL SHADE										
SHADE										

Surface Temperatures (continued):

DIRECTIONS: For most of these next surface temperatures, you can use natural surfaces (boulders or tree trunks, for example) or man-made surfaces (sidewalks, sides of houses, etc.).

	Hard surface	Soft surface	Dry surface	Wet surface	Smooth surface	Rough surface	Light surface	Dark surface	Wooden wall	Stone wall
SUN										
PARTIAL SHADE										
SHADE										

A Field, a Forest, and a Stream

ACTIVITY 9

Background:

All plants and animals have a particular place or area where they live called their **habitat**. While the term habitat generally focuses on a particular organism, an **ecosystem** encompasses a whole community of living things, non-living elements, and their interrelationships.

Plants and animals have many important interactions within their communities, and depend on different factors in their environment. Animals may depend on plants or other animals for food, and may use different plants for cover, while plants may need insects to pollinate them and earthworms to tunnel about so they add air to the soil.

Environmental factors—such as different climates, the amount of sunlight, the amount and type of water available (e.g., salt, fresh, moving, stagnant), the shape of the land, altitude, type and condition of soil in the area—will all help to determine what sort of plants and animals live in any given place.

What to Do:

1. Divide participants into four groups and ask each group to elect a Recorder to write down data they collect, and an Equipment Leader to pick up and return the required equipment. Groups can trade off roles between locations if they wish. Tell each group that they will investigate different aspects of the environment present in each of three locations similar to these: (1) the edge of a pond, stream or lake; (2) an open field; and (3) the forest floor.

2. Distribute the Data Collection Chart and equipment to each group. If possible, have volunteers oversee small groups. Review appropriate collection techniques and safety considerations (pages 17-18). Assign each group a role: soil, temperature, plant life, and animal life.

Soil Group: Ask this group to examine soil moisture at each location. Participants can use a trowel or stick to scrape the surface of the ground to obtain a small sample of soil. By feeling the soil, they should be able to tell whether it is wet, moist or dry. Test the soil at three places in each location. Record their observations. They might also record light intensity by using a photographic light meter.

Temperature Group: Ask this group to record the water temperature of the pond, stream, or lake and the air and soil temperatures at all three locations. They should also sketch out a brief diagram of the sun and shade pattern they observe at each location.

Summary:

Participants gather data on temperature and moisture from three different habitats.

Grade Level:

3-8

Time

1 hour 30 minutes

Learning Objectives:

Participants will be able to:

- ◇ Collect and record scientific data.
- ◇ Describe similarities and differences among three habitats observed.
- ◇ Make hypotheses regarding how different environmental factors affect temperature.

Materials Needed:

- ◇ Copies of the Data Collection Sheet
- ◇ Paper & clipboards or nature journals
- ◇ Pencils
- ◇ Trowel
- ◇ Outdoor thermometer
- ◇ Regional field guides (recommended, but optional)

BEST COPY AVAILABLE

ACTIVITY 9

A Field, a Forest, and a Stream

Plant Life Group: Ask this group to describe the various kinds of plants they observe (i.e., trees, shrubs, vines, grass, etc.). Suggest that they record what they observe to be the most common plants found in each location and note especially where each is growing relative to the others. Sketch these plants in a nature journal. If possible, provide a field guide for the group to use.

Animal Life Group: Ask this group to note the various kinds of mammals, insects, birds, reptiles, fish, frogs, tadpoles, and other creatures (or evidence of them such as scats, tracks, burrows) present in each location. See page 255 for additional wildlife clues.

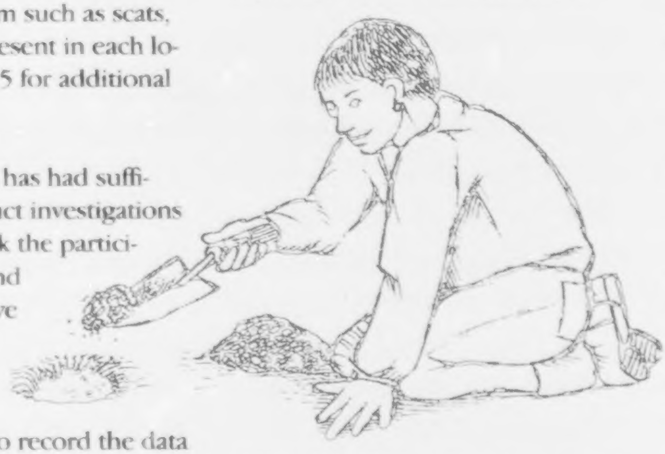
3. After each group has had sufficient time to conduct investigations in each location, ask the participants to regroup and share what they have recorded. Use an enlarged data collection chart on a board or flipchart to record the data gathered for each habitat listed on this chart.

4. Use the chart as a basis for leading a discussion with participants on the differences between the three habitats including:

- *How does the forest affect light intensity, humidity, air temperature, and soil temperature?*
- *How does the water (pond, stream, lake) influence the soil temperature and soil moisture?*
- *What is the influence of the amount of vegetation cover on soil moisture, or on temperature?*
- *What impact does air temperature, soil temperature, and light intensity have on wildlife?*

For Younger Participants (K-2):

Take the whole group to each of the sites and assist them in taking temperature readings at each site and making verbal observations of the plants and animals they see. If possible, take along several large sheets of posterboard—one for each site—and have participants take turns making drawings of the things they observe, so that each posterboard becomes an observation journal for the whole group. After visiting each site, return to the base and discuss what you found. *What differences did they observe? Why do they think those exist?*



Questions:

- How do temperatures differ in different habitats?
- Do plants affect temperature?
- Does water affect temperature?

Adaptations:

Refer to general adaptations on pages 11-16.

Hearing Disabilities:

- Have a set meeting place in case individuals get separated.
- Clearly mark the areas (use string or flags).
- Demonstrate how to use a thermometer and have participants practice the skill.
- Have all participants write down comments to facilitate effective communication in their small groups.
- Allow participants who have difficulty speaking to use the sign language interpreter to present their findings to the group.
- Position yourself and the sign language interpreter so the participants can see you for further directions or warnings while on the trail/at the site.

Learning/Cognitive Disabilities:

- Have a set meeting place in case individuals get separated.

A Field, a Forest, and a Stream

ACTIVITY 9

- Clearly mark the areas (use string or flags).
- Use the largest thermometer you can find. Demonstrate how to use the thermometer and have participants practice the skill.
- Have different soil samples for participants to touch and practice identifying (i.e., wet, moist, or dry) before they head out into the field.
- Keep groups small to allow for as much hands-on interaction as possible. If necessary, have two groups complete each of the assigned tasks and compare results.
- Provide small tape recorders for those participants who have difficulty writing to record their information or have them dictate input to the group Recorder.
- If appropriate, complete the younger student version of the activity.

Motor Disabilities:

Overall:

- Select a site that is largely accessible.

For participants with limited muscle strength, coordination, or dexterity of the hands:

- Use the largest thermometer you can find. Provide test tube clamps for participants who are unable to hold the thermometer. Build up the handles of the clamps with tape as needed.
- Provide small tape recorders for those participants who have difficulty writing or have them dictate input to the group's Recorder.

Visual Disabilities:

Overall:

- Clearly mark the trail/areas with a guide string on one side.
- Provide small tape recorders for participants to record their findings if they do not have a method of writing available to them, or have participants dictate input to the group's Recorder.
- Demonstrate how to use the thermometer and how to take the different temperatures. Have participants practice this skill.
- Have different soil samples for participants to touch and practice identifying (i.e., wet, moist, or dry) before they head out into the field.
- Have partners use vivid descriptions and encourage participants to touch and explore items to be observed; insure that participants are fully engaged in the activity.
- Have resources available in alternative formats.

For participants with low vision:

- Create a large print version of the Data Collection Sheet. Provide thick black markers for use.
- Use the largest thermometer you can find. Mark number increments with a black marker for easier viewing.
- Have a variety of magnifiers available.

For participants who are blind:

- Create a Braille version of the Data Collection Sheet.
- If possible, purchase a Braille thermometer for this activity. If not, use the largest thermometer you can find. Mark every ten degrees in Braille, every five degree with tape, and place a single dot of glue for each degree in between. Have partners assist with reading the thermometer.

Copied with permission, American Forest Foundation, Copyright 1993/1994/1995/1996/1997/1998, Project Learning Tree Environmental Education Pre K-8 Activity Guide. *The complete activity guide and high school modules can be obtained by attending a PLT workshop. For more information visit the Project Learning Tree website at www.plt.org*

WORKSHEET

A Field, A Forest, A Stream

Date:

Time:

Weather Conditions:

Habitat			
Characteristic	Forest	Field	Pond, Lake, Stream
Moisture			
Soil			
Air			
Temperature			
Air			
Water			
Soil			
Plants			
Animals			
Light Intensity			

Sand, Silt, and Clay

ACTIVITY
10

Background:

Soil particles come in many different sizes and weights. This occurs because some rocks and minerals are harder than others. The harder materials do not break apart as easily as do the softer rocks or minerals.

Most soils contain some mixture of different sized particles that can be placed in three basic categories: sand, silt and clay. **Sand** is the coarsest, or largest-grained particle, and the finer-grained **silt** follows. **Clay** has the smallest particles, so small they can easily become suspended in water. Particle size affects how well the soil holds water for plants and how readily water moves through the soil.

So for example, a very sandy soil does not hold water very well, it will usually pass through quite quickly. A soil made up of mostly clay, on the other hand, may keep water from passing through well, and so it may pool or run off. Different plants are suited to different soil compositions, though most require some kind of combination of all three particle sizes.

What to Do:

Preparation: Before this activity, scope out the surrounding area to locate places where the participants will be able to find different kinds of soil. Look in dry and moist areas, on slopes, near streams, etc. Doing this ahead of time will allow you to guide the group more effectively.

1. Ask participants, ***What do you know about soil? Why is it important? What would you like to know about soil?*** Brainstorm some ideas and questions. Guide them towards realizing that soil is essential for plant growth, the foundation of most ecosystems.

2. Divide the group into groups of 2-4 participants. Give each group a jar/container for collection. Take the groups outside and ask each group to collect one soil sample from a different area. If possible, have volunteers oversee each group. Participants will need to collect enough soil to fill their jars/containers one-quarter full. Make sure they note where they collected their sample.

3. When the groups have completed their collection and returned to your site, have participants add water until the jar is two-thirds full. Have the participants take turns shaking each jar vigorously for a total of two minutes, and then allow the contents to settle for 15-30 minutes. If desired, during this waiting period complete a soil testing experiment using a commercially available soil testing kit.

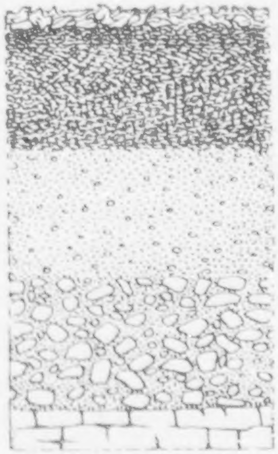
Summary:
Participants explore the properties of soil.

Grade Level:
3-7

Time:
1 hour

Learning Objectives:
Participants will be able to:
◇ Describe the variety of particle sizes present in soil.
◇ Observe differences in soil type.
◇ Predict the influence of particle size on water movement.

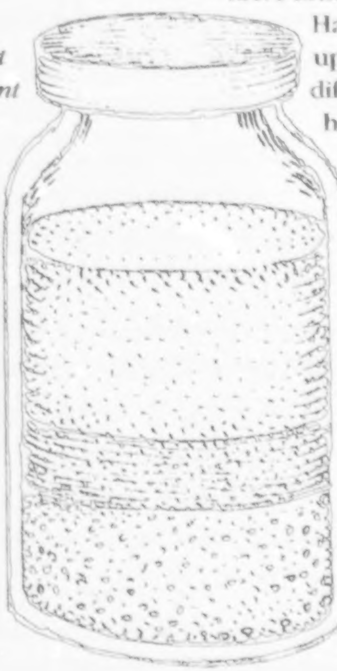
Materials Needed:
◇ Tall glass jar with lid for each group
◇ Spoons or garden trowels
◇ Water
◇ Paper and pencils/markers
◇ Optional: commercial soil testing kit



4. After the waiting period, ask participants to hold a piece of paper against the side of each jar; draw a diagram showing the different layers; and label each layer based on its particle size.

5. Discuss what they found. The largest (heaviest) pieces of soil in the glass jars will settle to the bottom first. These may be identified as sand. The smaller pieces settle very slowly and may be identified as silt. Some particles never settle but stay suspended in the water and are clay. Clay eventually will settle but rarely within 15-30 minutes. If possible, observe the jars over a longer period of time and graph the build-up of the clay layer to see just how slowly it forms.

6. Ask participants, *What do you think the different particle sizes mean for plants growing in that soil?* For more advanced participants, have each group design an experiment to investigate this question. (They will not need to do the experiment, unless there is enough time, but they can design it orally, or on paper.) They may draw sketches and make a step-by-step plan. Each group should present their experiment to the larger group for questions.



***Note:** Review collection and safety techniques (pages 17-18).*

For Younger Participants (Grades K-2):

Take participants outside to an appropriate place where you can dig a hole without a problem (you will fill it back up later.) Together, dig a hole large enough so everyone can see into it and deep enough that you begin to see layers. Ask participants, *What do you see?* Look at the soil from the top layer, down as deep as you can see. *Are there changes they observe?* Have participants pick up handfuls of soil from different parts of the hole. *What do they feel like? How are they different? What is growing in it? What kind of soil do you think plants like?*

Questions:

- What are the different kinds of soil?
- How do they interact with water?
- How does the soil type in a place impact the kinds of plants growing there?

Adaptations:

Refer to general adaptations on pages 11-16.

Hearing Disabilities:

- Have samples of each of the soil types for participants to see and touch.
- Use a timer with a visual display.
- Have all participants write down comments and input to facilitate effective communication in their small groups.

Learning/Cognitive Disabilities:

- Have samples of each of the soil types for participants to see and touch before beginning the experiment.
- Have labels made ahead of time for participants who have difficulty writing.
- Have pre-drawn jars for participants to color in as needed.
- Use a timer that participants can see and hear.
- If appropriate, complete the younger participant version of the activity.

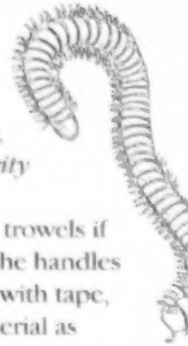
Motor Disabilities:

Overall:

- Select a largely accessible site for soil collection.

Sand, Silt, and Clay

ACTIVITY 10



For participants with limited muscle strength, coordination, or dexterity of the hands:

- Have adaptive garden trowels if available or build up the handles on spoons or trowels with tape, foam, or bandage material as needed. You may also use ice cream scoops.
- Have funnels available as needed.
- Put water in easy to squeeze bottles with squirt-top lids.
- Have sticker labels made ahead of time for participants who have difficulty writing.
- Have pre-drawn jars for participants to color in as needed.

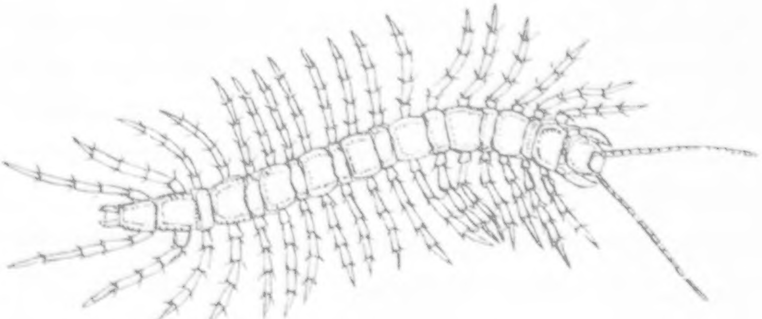
Visual Disabilities:

Overall:

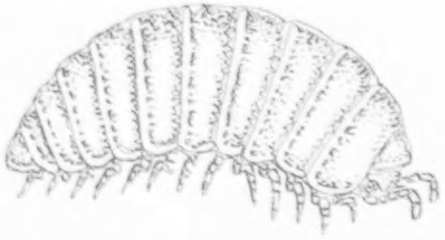
- Have samples of each of the soil types for participants to touch.
- Clearly mark the trail with a guide string on one side.
- Use the soil samples while on the trail by having students with visual impairments match the different types of soil while collecting.
- Use a timer that participants can hear.
- Have funnels available as needed.
- Have water bottles with labels in both Braille and large print letters.

For participants who are blind:

- Have Braille soil labels already made or have a Braille labeler on hand for participants to use.
- Use a plastic tub with a lid instead of a glass jar. Have participants hold it upright while the contents settle. Poke holes (instructors complete this task as needed) in the bottom of the tub and allow water to drain out; do this outside or over a sink or trash can. Invert the tub and gently remove the container from its lid, allowing the lid to act as a base. Have participants feel the layers and describe them to the group.
- Have participants make a model of the layers using three different items to represent the soil types (e.g., rice, beans, and noodles) or by using dry soil samples.



Copied with permission, American Forest Foundation, Copyright 1993/1994/1995/1996/1997/1998, Project Learning Tree Environmental Education Pre K-8 Activity Guide. *The complete activity guide and High School Modules can be obtained by attending a PLT workshop. For more information visit the Project Learning Tree website at www.plt.org*



ACTIVITY
11

Compost Crazy

Summary:
Participants create their own group compost bin.

Grade Level:
4-8

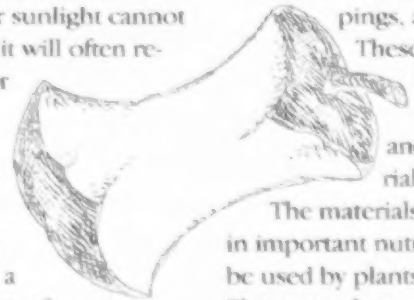
Time:
1 hour or more for initial set-up, then ongoing 15-30 minute sessions over three or more months.

Learning Objectives:
Participants will be able to:
- Explain the decomposition cycle.
- Discuss ways composting can help the environment.
- Create a worm bin and demonstrate its effectiveness in decomposing food scraps.

Materials Needed:
- A bin, 16" X 24" X 8" (about the size of an apple crate), or 10 gallons (or the materials to make such a bin)
- For wooden bins: a plastic garbage bag or other liner
- About 50 sheets of newspaper
- 2-4 cups of soil
- 1 pound of red worms (about two generous handfuls)
- Enough food each week to keep worms happy (worms eat three times their weight each week)
- Spray water bottle, to keep bedding moist (but not soaking)
- Small shovel

Background:

Composting food and lawn waste has many benefits over sending it to a landfill. Landfills are often so large and compacted that decomposers, air or sunlight cannot reach the waste, so it will often remain unchanged for many years after it was deposited. Thus landfills grow to massive proportions. Composting can actually reduce a considerable amount of waste in a relatively short amount of time; it also cuts garbage bills and creates a nutrient-rich, moisture-laden soil for gardening.



There are a number of ways to **compost** food scraps and lawn waste. One way is to put them in a compost bin and turn the pile frequently to encourage various microorganisms using bacteria to break it down. The worm bin described below is another efficient way to compost, and it allows the worms to do most of the work. Using worms to compost is called **vermicomposting**. With a classroom worm bin, participants will be able to observe the decomposition cycle as it happens and learn a way to positively impact their environment. Also, if the group is planting a garden or wildlife habitat, the bin will produce good soil for their plants.

The decomposition cycle is a very important part of the cycle of life. Decomposers such as worms, fungus, bacteria, and beetles eat portions of dead organisms, including leaves, old logs, animal droppings, and dead animals. These decomposers help break down the dead matter, and excrete the materials they don't use. The materials left over are rich in important nutrients, which can be used by plants through the soil. Plants use these nutrients to help them grow, and animals eat the plants, and so on.

All earthworms act as decomposers in some way. They also **aerate** (move air through) the soil when they burrow, which helps plant growth and aids decomposition. Many earthworms were accidentally introduced into North America when Europeans brought potted plants over in the 1800s. Most people are familiar with the large, thick worms called "night crawlers" *(Lumbricus terrestis)*. They generally live between the top layer of soil, which consists mostly of decaying matter, and the second layer, which is a mix of minerals and organic material. Night crawlers eat decaying matter and mix organic material between layers. While they are important to farmers and gardeners, they do not prefer the extremely rich environment of most compost bins. Red

Compost Crazy

worms, or "red wigglers" *(Eisenia fetuda)*, live primarily among leaf litter and in the organic material-rich top layer of the soil. They eat and break down the larger bits of decaying material, and their castings form a rich soil. Red worms, then, do an excellent job of breaking down excess food scraps for compost bins.

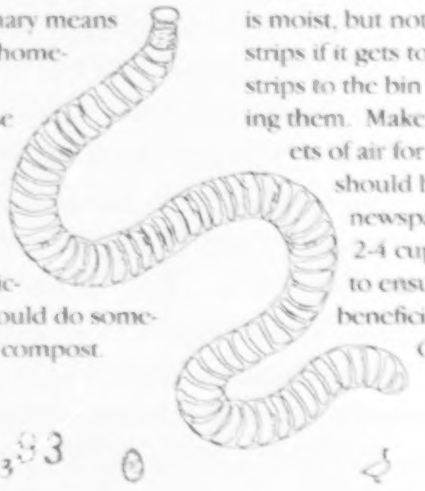
For a classroom worm bin, it is important to keep the food scraps small so that the worms can eat through them before flies arrive or before the bin begins to smell bad. Citrus fruit peels (they are acidic and attract fruit flies, which are hard to get rid of) and broccoli and onions (they are smelly) should also be left out. Worms have a hard time breaking down meat or other animal products efficiently, and so it is very important to leave these out of a worm bin (or any compost bin, for that matter).

What to Do:

1. Ask participants, ***What do you think happens to leaves, flowers, plants, animals at the end of their lifecycles? How does the food web continue? What have you seen in nature that would give you some ideas about this process?*** Write down and discuss participant ideas and guide participants towards an understanding of decomposition. ***Why is decomposition important? What role do decomposers play in the food web?*** If the group has not already taken part in the activity "Small Seek" on page 188, consider doing this as a lead-in to this activity.

2. Tell participants that for this activity, they will have the opportunity to watch decomposition in action by creating and maintaining a worm compost bin. Discuss the term *composting*. Ask participants if any of them have a compost pile or bin at home, and if they do, ask them what they do with it. Discuss what happens to leftover food, lawn clippings and other waste. If possible, have participants find out whether their region collects lawn bags to recycle lawn waste or if all trash goes to a landfill. Ask participants, ***What are some problems with sending everything to a landfill?*** (Landfills grow until there is no space left, materials degrade much slower in a landfill, and landfills often leak toxic materials into surrounding water supplies, etc.)

3. If possible, visit a local organic farm or a garden that uses compost as a primary means of fertilization. A homeowner willing to show how they use compost in their garden would also be appropriate. After such a field trip, ask participants how they could do something similar with compost.



4. Ask participants if they know what role earthworms play in the soil. Discuss the difference between "night crawlers," which live deep in the soil, and "red wigglers," which live near the top of soil and help to decompose leaves and other organic materials.

5. Have participants help set up the worm bin: Locate or make a bin, approximately 16" x 24" x 8" or 10 gallons. It can be wooden, plastic or glass, though wooden bins should be lined with plastic (like a garbage bag or old shower curtain). Rinse the bin clean with tap water, since some residues can harm the worms that will live in it.

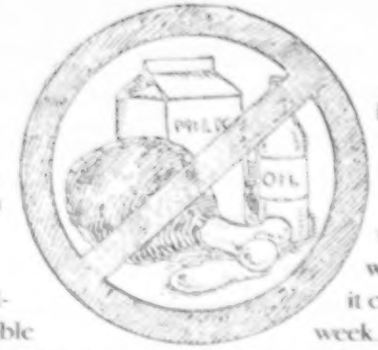
6. Prepare bedding consisting of moist newspaper. Like soil, newspaper strips provide air, water, and food for the worms. Use about 50 pages and tear them into 1/2" to 1" strips. Use black and white print; color print can be toxic to the worms. Put the newspaper strips into a large plastic garbage bag or container. Add water until bedding is moist, but not dripping. Add dry strips if it gets too wet. Add the strips to the bin without compressing them. Make sure to leave pockets of air for the worms. The bin should be 3/4 full of wet newspaper strips. Sprinkle 2-4 cups of soil in the bin to ensure the presence of beneficial microorganisms. Gritty soil particles

also aid the worms' digestion. Potting soil, or fairly rich, moist soil from outdoors is fine.

7. Before adding worms, measure their weight. If a scale is unavailable, estimate: two big adult-sized handfuls of worms are about equal to a pound. The weight of the worms is important for knowing how much food to feed them and for record keeping. Add worms to bin.

8. Have participants bring in food scraps from home, gather them from their lunches or snacks, or have them work out a deal with the cafeteria if the group's facility has one.

9. Bury food scraps under bedding. Feed the worms fruit and vegetable scraps that would normally be thrown away, such as peels, rinds, cores, etc. Limit the amount of citrus fruits placed in the bin. NO MEATS, BONES, OILS OR DAIRY PRODUCTS. Cut or break food scraps into small pieces—the smaller, the better. Measure the amount of food on a scale if possible. If a scale is unavailable, a quart-sized container will probably hold a pound of food scraps, though this will vary with the types of food you use. Feed worms approximately three times their weight per week. Monitor the bin every week to see if the worms are eating the food. Adjust feeding levels accordingly. (One pound of worms requires 3 pounds of food per week).



10. Place a full sheet of dry newspaper on top of the bedding. This will help maintain the moisture balance, keep any possible odors in the bin, and help prevent fruit flies from making a home in the bin. Replace this sheet frequently if fruit flies are present, or if bin gets too wet.

11. Cover the bin with a lid made of plastic, plywood, or cloth, but leave the lid ajar so the bin receives some air. If desired, drill small holes into the bin. Place the bin away from windows and heaters.

12. To keep worms happy, feed them about once a week. If bedding dries up, spray with water. (If bedding gets too wet, add dry newspaper strips.) Fluff up bedding once a week so the worms get enough air.

13. Have participants look at the data sheet and make hypotheses (i.e., educated guesses as to what will happen) about the food scraps when placed in the worm bin. As the worms eat through the compost, have participants observe what happens to it. Have them record observed data, including change in height of compost level, general appearance of compost, and the status of the worms. The worksheet outlines several different data participants can collect. Consider laminating the worksheet, and have participants write on it with a grease pencil so it can be reused week to week. If possible, have them write their thoughts in a journal each week.

14. Give different tasks to each participant in taking care of the worms each week: One job includes adding compost when worms have eaten all the food and bedding, and harvesting the compost. Participants can begin this process by scooping all the material over to one side, placing down new bedding in the empty area, and putting new compost on top of the new bedding. The worms will make their way over to the new compost area in a week or so, at which time participants can harvest without too much trouble.

Another task: make sure material isn't too wet or too dry. Worms will drown or try to crawl out of the bin if it is too wet and they will die if it is too dry. Other participants can measure the amount of compost added and how much the level of the material goes down after worms have eaten it. *How do their hypotheses compare to the data they are collecting?*

15. As compost becomes available, use it in the facility's garden or

Compost Crazy

grounds, or for growing potted plants. Have participants make notes of the plants' growth.

For Younger Participants (Grades 1-3):

The concept of composting may be difficult for young children. One idea is to set up a see-through compost bin (use a clear plastic bin) in the facility's room, add earthworms and have participants make close observations of what happens periodically. If they can clearly observe the process, they will be stimulated to ask questions and begin to understand the idea.

Questions:

- What is compost?
- How is it made?
- How does it help plants and the environment in general?

Adaptations:

Refer to general adaptations on pages 11-16.

Hearing Disabilities:

- Have pictures of landfills available to help illustrate the point.
- Have compost and traditional soil samples available for participants to see and touch; allowing them to compare the two.

Learning Disabilities:

- Have pictures of landfills available to help illustrate the point.
- Illustrate the decomposition process by using different sized balls as you explain it as needed. For example, use a basketball, a softball, a tennis ball, a ping-pong ball, and a marble to demonstrate the breakdown of food scraps into compost.
- Have compost and traditional soil samples available for participants to see and touch, allowing them to compare the two.
- Allow participants who have difficulty working with weight measurements to use cups or scoops to measure all necessary materials.
- If possible, have participants collect food scraps at home to bring in to help reinforce learning.
- Have participants work in pairs or small teams and create a concrete schedule of tasks for them to follow to care for the worms.

Motor Disabilities:
Overall:

- Create a raised compost bed (approximately 27 inches high at the top of the bin) or a table-top bin to provide easy access for participants who use wheelchairs.

For participants with limited muscle strength, coordination, or dexterity of the hands:

- Have adaptive scissors available for participants who have difficulty tearing strips of paper.
- Build up the handle of a kitchen scoop (ice or flour) for participants to measure worms, soil, and food scraps. Assist as needed.
- Have an adaptive rocker knife available to cut food scraps into small pieces.

Visual Disabilities:

- Illustrate the decomposition process by using different sized balls as you explain it. For example, use a basketball, a softball, a tennis ball, a ping-pong ball, and a marble to demonstrate the breakdown of food scraps into compost. Encourage participants to handle each of the balls to help them understand the process.
- Have compost and traditional soil samples available for participants to touch, allowing them to compare the two.
- Encourage participants to touch the worms and fully participate in the experiment.
- Use cups or scoops to measure all necessary materials.
- Have a partner or volunteer verbally walk participants through steps of creating and caring for the compost bin.
- Once they learn the steps, participants should be encouraged to be as independent as possible in completing the necessary tasks.

© Jen Fong and Paula Hewitt. Adapted with permission from, "Worm Composting Basics," Cornell Waste Management Institute's website

WORKSHEET

Compost Crazy Data Sheet

Hypothesis:

Date: Time: Observer:

Data for:	Week 1	Week 2	Week 3	Week 4
Approx. amount of worms (in lbs.)				
Approx. amount of compost added (in lbs.)				
Height of compost at beginning of week (in inches)				
Amount of change in compost level (height of last week - height of this week, in inches)				
Description of compost (color, food scraps still obvious, a mix of soil and scraps, mostly soil, smelly, fungus growing, etc.)				
General condition of worms (healthy, crawling out of bin, dying, etc.)				

Making a Model Streambed

ACTIVITY 12

Background:

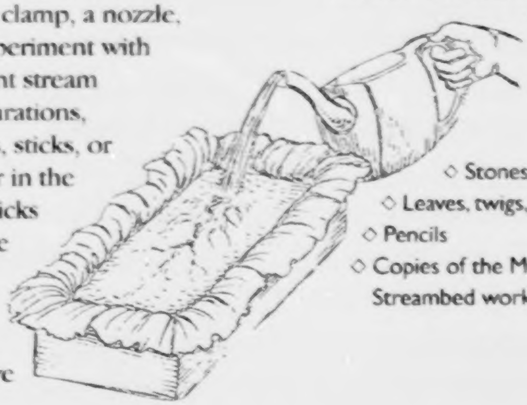
Water never moves straight down a slope. Any stream of water flows like many different strands of water together, each moving at slightly different speeds and constantly affected by variations in the land. When the stream meets an obstacle, like a big slab of rock, the flow is bounced from its downhill movement and begins to curve away. The outer edge of the water picks up speed, but curves into an arch when the slower water on the inside slows it down. A curving stream moves like a pendulum—a swing in one direction results in another swing to the other side, and so forth. Water also twists as the liquid strands flow down the streambed. Watching the movement of water can be fascinating and can help students understand the processes that shape land over time!

What to Do:

1. Ask, *Have you ever watched the way water moves? What do you notice about it?* Take the group outside to a place where you can reach a hose and some bare soil or sand. Have a participant point the hose at the ground and run it for a minute or two with everyone watching. Ask, *What do you notice about the stream of water? What do you notice about the soil? What is happening? What do you think might happen if the water ran for a very long time?*

2. Return to the classroom/home base and ask participants if they have ever been to a river or stream. Rivers and streams shape the land over time. Explain that we can begin to understand the way rivers sculpt the land through which they travel by observing how a trickle of water makes little gullies in a sandy slope. By making a model streambed, it is possible to study the larger process and become familiar with the interplay of land and flowing water.

3. Divide the group into pairs or small groups, depending on available materials. Explain that the board/backside of the cookie tray represents the land. Have them place their cookie tray in a large, shallow cardboard box lined with plastic to catch runoff. Cover the "land" with at least one inch of sand. Represent a stream with water flow from a watering can or a hose with some way to vary the force of the flow, such as a clamp, a nozzle, or a spigot. To experiment with a variety of different stream conditions/configurations, collect some rocks, sticks, or leaves to put on or in the sand. Stones or bricks put under one side of the board would change the slope for different effects. Have



Summary:

Participants simulate the effects of water over time on a streambed.

Grade Level:

6-12

Time:

1 hour

Learning Objectives:

Participants will be able to:

- ◇ Observe water flow.
- ◇ Test the effects of land formations and natural obstacles on water flow.
- ◇ Make predictions about the way rivers and streams affect land formation over time.

Materials Needed:

- ◇ Sand
- ◇ Water from a hose, watering can, or other device that will create a steady flow
- ◇ A flat, water-resistant surface that can be raised to make a slope (board, cookie sheet, etc.)
- ◇ Shallow cardboard box
- ◇ Plastic garbage bag, cut open to be flat
- ◇ Stones or bricks
- ◇ Leaves, twigs, rocks, etc.
- ◇ Pencils
- ◇ Copies of the Model Streambed worksheet

Making a Model Streambed

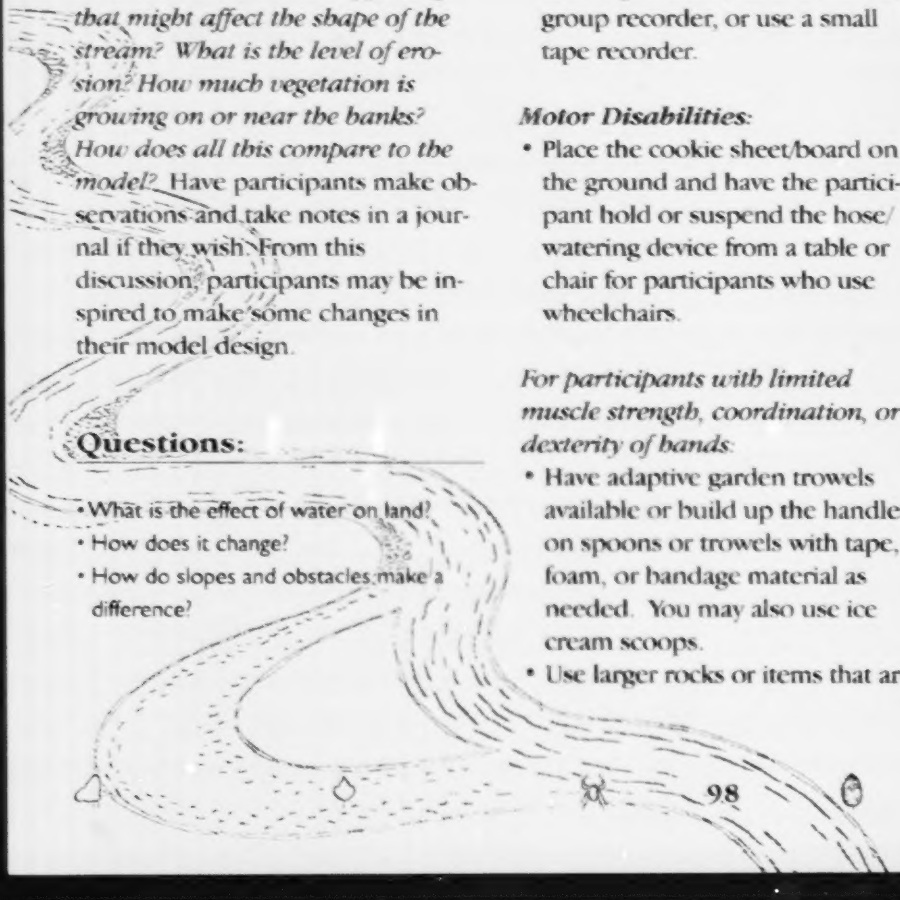
participants create their models and complete the Model Streambed worksheet, making a prediction before testing each condition. Make a simplified version of the worksheet for younger participants.

4. Discuss how their findings might apply to the "real world" of rivers and streams. *What have they learned? Can they think of examples of places where the effects of rivers on land over time are very obvious?* (e.g., the Grand Canyon.)

5. If there is an actual streambed nearby, take the group on a short walk along its banks to compare it to the model. *What shape does this stream take? What is happening that might affect the shape of the stream? What is the level of erosion? How much vegetation is growing on or near the banks? How does all this compare to the model?* Have participants make observations and take notes in a journal if they wish. From this discussion, participants may be inspired to make some changes in their model design.

Questions:

- What is the effect of water on land?
- How does it change?
- How do slopes and obstacles make a difference?



Adaptations:

Refer to general adaptations on pages 11-16.

Hearing Disabilities:

- Have all participants write down comments to facilitate effective communication in their small groups.

Learning/Cognitive Disabilities:

- Demonstrate each step of the assembly process as you describe the directions.
- Make a simplified version of the worksheet as needed.
- Have participants who have difficulty writing draw their responses to the questions, dictate them to a group recorder, or use a small tape recorder.

Motor Disabilities:

- Place the cookie sheet/board on the ground and have the participant hold or suspend the hose/watering device from a table or chair for participants who use wheelchairs.

For participants with limited muscle strength, coordination, or dexterity of hands:

- Have adaptive garden trowels available or build up the handles on spoons or trowels with tape, foam, or bandage material as needed. You may also use ice cream scoops.
- Use larger rocks or items that are easy to manipulate.
- Suspend the hose or other watering device from a table or chair for participants who have difficulty holding them.

Visual Disabilities:

Overall:

- Have samples of each of the materials for participants to touch.
- Have participants feel the cookie sheet/board to get familiar with its dimensions before they begin.
- Have participants feel the finished product before and after the water is added to feel the differences.
- Have materials separated and labeled in both Braille and large print.

For participants with low vision:

- Have the worksheet available in large print. Provide thick black markers for use.
- Use brightly painted rocks as needed.

For participants who are blind:

- Have a Braille version of the worksheet available.
- Use rocks or different textured items (e.g. wooden spools, marbles, etc.).
- Have group participants give feedback and guidance throughout the activity.

© 1994 Hunken, Jorie. Adapted with Permission from "Making a Model Streambed," Ecology for All Ages: Discovering Nature Through Activities for Children and Adults, *The Globe Pequot Press, 1994, p. 41.*

Making a Model Streambed

WORKSHEET

DIRECTIONS: Using your model, try to simulate the following situations and answer the following questions.

1. What is the difference in the flow pattern between land with a small amount of slope and land with a steep slope? (Try to keep the amount of water flow the same so that your only variable is the steepness of the slope.)

   Hypothesis:

   What happened:

2. When the flow of water meets an obstacle such as a rock, what happens to the shape of the stream? What is the effect on the sand?

   Hypothesis:

   What happened:

3. Compare the size of the particles of sand in the runoff with those left in the streambed. What differences do you notice?

4. Let the water flow from one spot for a while and watch just one curve develop and change. Repeat your procedure and describe the general dynamics of flowing water and the production of curves.

   Hypothesis:

   What happened:

5. To simulate fibers of leaves and rootlets that would be found in the soil where plants grow, mix into the sand some bits of leaves, paper, or pieces of dry spaghetti. What is their effect on the stream flow?

   Hypothesis:

   What happened:

ACTIVITY
13

The Water Cycle

Summary:

Participants observe how water is continuously cycled between land, water formations and the atmosphere.

Grade Level:

2-8

Time:

2 hours, plus observation time on several days following

Learning Objectives:

Participants will be able to:

- ◇ Explain how the water cycle recycles the Earth's water supply.
- ◇ Make use of the knowledge of land and water formations.
- ◇ Form a hypothesis on how/why the water cycle works.
- ◇ Connect the concepts of precipitation, condensation and evaporation.

Materials Needed:

- ◇ Potting soil
- ◇ Water
- ◇ Spray bottle
- ◇ Small margarine container
- ◇ Large, clear plastic container or an aquarium
- ◇ Plastic wrap
- ◇ Fast and reliable germinating seeds (marigolds, herbs, lima beans, etc.)
- ◇ Plastic trees, animals, houses, etc. (optional)
- ◇ Tape or rubber bands
- ◇ Bag of ice
- ◇ Heat lamp
- ◇ Copies of the Water Cycle worksheets

Background:

By creating a terrarium, participants will examine first-hand how water is continuously cycled between the Earth and the atmosphere. In the **water cycle**, the sun heats the Earth's surface, which causes water to **evaporate** into water vapor collecting in clouds that rise in cold air. When water vapor collects on tiny dust particles and forms a cloud, this process is called **condensation** (in a terrarium, condensation occurs as beads of water on the walls or the plastic cover). When clouds become too heavy to float, they release their moisture as **precipitation** (rain, snow, hail, etc.). The precipitation collects in freshwater systems like lakes or rivers, and often ends up in the oceans. Precipitation can reach these bodies of water directly, or it may reach them via **runoff** from the land, as water runs downhill.

Another path rainwater (or ice and snow) may take, which will be difficult to show in a terrarium, is to **percolate**, or filter, its way through layers of soil into large underground reservoirs of water. The water in these "underground rivers" is called **ground water**. Ground water often reaches waterways by trickling back up to the surface.

Once precipitation reaches a water body, much of it may evaporate into the air, repeating the cycle once again, though there are many other opportunities for water to evaporate along the way. It may evaporate off the land surface after a rain. It may also evaporate off of people and other animals as we perspire. Plants are the most efficient movers of water, however, as they soak it in through their roots and pull it up to create food and transport it throughout their systems. In a process called **transpiration**, some of the water that reaches the leaves of plants evaporates off into the air as water vapor (participants can see this in a terrarium as water condenses around the glass near the plants).

What to Do:

1. Begin a discussion on the different parts of the water cycle: evaporation, precipitation, and condensation. Review the illustration of the water cycle *(see worksheet)*. Ask, ***What are clouds? What are they made of? What is rain? Why does it rain? Where does the rain go*** *when it falls? How does water get into lakes and rivers?*

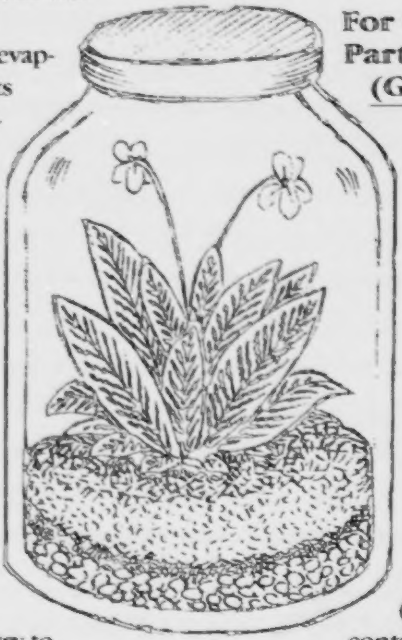
2. Have participants help to assemble terrariums. Depending on the size of the group, this can be done in pairs or small groups. They should arrange the soil in the container to resemble mountains, plateaus, hills, etc. Next, they should place the margarine bowl in a depression in the soil and fill it with water. Following instructions on the package, participants should plant a few seeds in the soil, and water them. If participants wish to place plastic trees, animals, or houses in the terrarium, they should decide how they want these props arranged. Have them cover the entire terrarium with the plastic wrap and secure it tightly with tape or a rubber band. Have participants label terrariums and place them in a sunny spot.

3. Discuss with participants what they think will happen in their terrariums and form a hypotheses.

4. Tell participants to watch for condensation on the plastic "sky" of the container. When enough moisture collects, it should fall onto the various landforms as precipitation. Some of the precipitation will collect in the margarine bowl "lake" directly or flow into the "lake" from the land.

5. Have participants observe their terrariums over a few days and record their observations in a journal, in writing and/or pictures. They may also use the worksheet included in this activity. Encourage participants to draw what they observe using arrows that indicate precipitation, condensation, and evaporation. Participants should make observations at different times of day and/or during different weather conditions. For example, they might make observations in the morning, in the middle of the day, and right before they leave for the day. Or they might observe in the middle of the day, every day, and try to be sure they observe on at least one cloudy and one clear day. Participants should make hypotheses as to what will happen at different times of day or on a cloudy vs. a clear day. For example, one participant might state his or her guess that there will be less condensation on the inside of the terrarium on a cloudy day.

6. Have participants use a bag of ice to cool the terrarium down by placing it on one end of the cover, and a heat lamp to warm the terrarium up. Have participants develop hypotheses on the cooling and warming effects on the water cycle and the growth of their seeds.



For Older Participants (Grades 9-12):

Follow most of the same basic procedures above, but have participants create two or more terrariums to determine the role of different substances in the water cycle. For example, one test terrarium might include the elements mentioned above (soil, a margarine container with water, a cover, etc.) except for the seedlings. Another might contain only enough soil to keep the plants alive, and another might have no "atmosphere" (the cover). Participants can keep track of the water levels by dividing the margarine container into different volume levels (so they would, for example, mark each 250 milliliters on the inside of the container), and/or by placing a rain gauge on the wall of the terrarium.

ticipants compare water levels on different days, and make conclusions. Ask participants to determine what each of these elements represent in the water cycle. *When certain elements are removed or altered in the actual water cycle, what happens? How do people affect the water cycle? How can they make their impact a more positive one?*

Questions:

- Where does the rain come from?
- What are some of the different things that happen to rainwater when it falls to the ground?
- Why is it called the water cycle?

Adaptations:

Refer to general adaptations on pages 11-16.

Hearing Disabilities:

- Consider creating an interactive water cycle display for participants to explore. For example, use a watering can to create precipitation, with some of the precipitation being diverted as runoff. Use a sponge (to represent soil)sitting in a pan of water to simulate ground water. If you have a hot plate or another way to heat water, you can create evaporation. Have participants hold their hand above the hot water so they can feel the humidity of the water molecules in the air. Make sure participants do not get close enough to the hot water to burn themselves. Simulate condensation by spraying a plant with water, allowing participants to touch the dew-drenched leaves. Make sure to describe the process in detail and work with the sign language interpreter as participants go through it.

Learning/Cognitive Disabilities:

- Consider creating and interactive water cycle display for participants to explore. For example: use a watering can to create precipitation being diverted as runoff. Use a sponge (to represent soil) sitting in a pan of water to simulate ground water. If you have a hot plate or another way to heat water, you can create evaporation. Have participants hold their hand above the hot water so they can feel the humidity of the water molecules in the air. Make sure participants do not get close enough to the hot water to burn themselves. Make sure to describe the process in detail as participants go through it.
- Demonstrate each step as you explain how to create a terrarium. Have a finished terrarium on display for participants to model as needed.
- Have partners assist with terrarium assembly and journaling as needed. An alternative is to assist participants who have difficulty writing or drawing to take instant photos of their terrariums and to assemble a water cycle poster or photo journal of their project.
- Have pre-made labels available.
- Assist participants in forming their hypotheses as needed. Ask them, *What do you think will happen to the water cycle when we cool your terrarium? When it is warmed?*

Motor Disabilities:

Overall:

- Adjust height and angle of work surface as needed. You may need to set the container on a chair so participants can reach down into it to fill it.

For participants with limited muscle strength, coordination, or dexterity of the hands:

- Build up the handles on pencils with tape, foam, or putty.
- Have participants who have difficulty writing use a small tape recorder or dictate their answers to a partner. An alternative is to assist participants who have difficulty writing or drawing to take instant photos of their terrariums and to assemble a water cycle poster or photo journal of their project.
- Have pre-made labels available.
- Have partners assist with assembly as needed.
- Use lima bean seeds that are easier to manipulate than smaller seeds.
- Have adaptive garden trowels

available or build up the handles on long-handled spoons or trowels with tape, foam, or bandage material as needed. You may also use ice cream scoops.

- Use larger items (e.g., plastic trees, animals, etc.) that are easier to manipulate.
- Suspend the watering can from a table or chair for participants who have difficulty holding it or assist as needed.

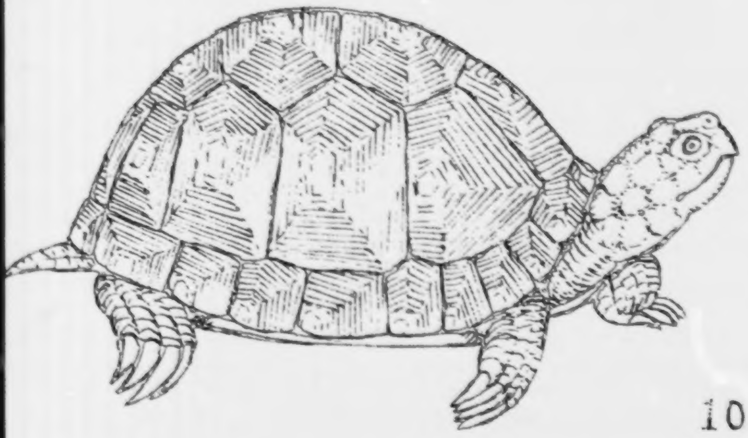
Visual Disabilities:

For participants with low vision:

- Enlarge the water cycle table worksheet or create a poster-sized version labeled in large print.
- Provide thick black markers for use in journaling.
- Use brightly colored objects (e.g., plastic trees, animals, etc.) that provide contrast in the terrariums.

For participants who are blind:

- Make a water cycle poster with different fabrics representing each of the stages. Connect the stages with arrows made from raised lines of glue or yarn; label in Braille. Another option is to create an interactive water cycle display for participants to explore. For example: use a watering can to create precipitation, with some of the precipitation being diverted as runoff. Use a sponge (to represent soil) sitting in a pan of water to simulate ground water. If you have a hot plate or another way to heat water, you can create evaporation. Have participants hold their hand above the hot water so they can feel the humidity of the water molecules in the air. Make sure participants do not get close enough to the hot water to burn themselves. Simulate condensation by spraying a plant with water, allowing participants to touch the dew-drenched leaves. Make sure to describe the process in detail as participants go through it.
- Have partners verbally guide participants through the assembly process. Make sure that partners are not doing the entire project.
- Have a Braille labeler available.
- Have participants feel the container to get familiar with its dimensions before they begin.
- Have participants feel the finished product immediately after the plastic is added. Over the course of several days, have them feel the plastic as their partners observe what is happening. Once condensation starts to form, participants should be able to feel the plastic sag and cave-in in places. Have partners vividly explain what they see in the terrarium to participants who are blind (e.g., "There are small beads of water clinging to the inside of the plastic.").



The Water Cycle

Draw a Picture of Your Terrarium:

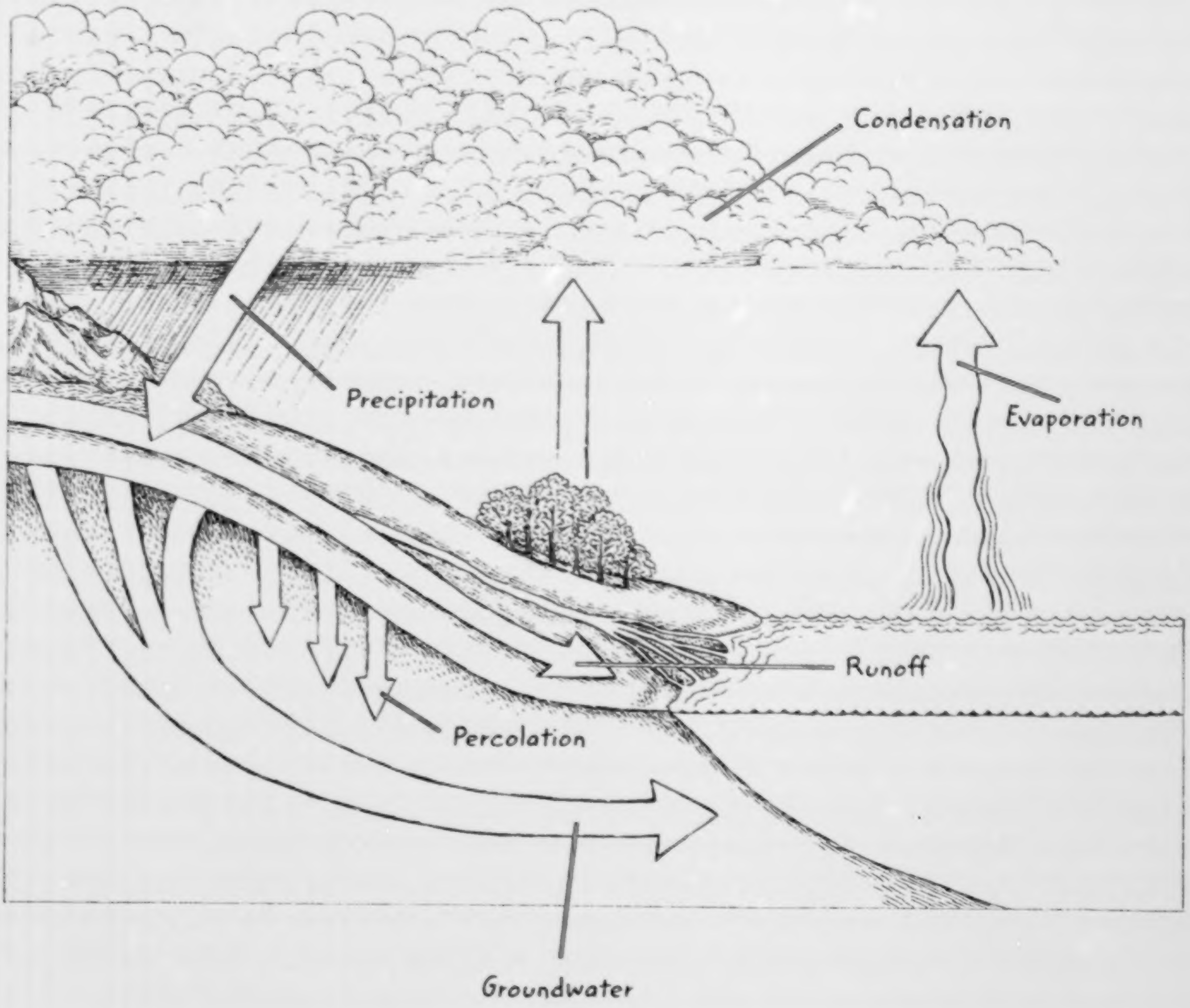
Draw a Diagram of the Water Cycle in Your Terrarium

(Make sure to use arrows to show the direction water travels, and include at least these three stages: Precipitation, Evaporation, and Condensation. Other important stages that are harder to see in a terrarium include: Transpiration from plants, Runoff from land into waterways, and Percolation into the ground water.)

The Water Cycle

WORKSHEET

Water Cycle Diagram


Condensation
Precipitation
Evaporation
Runoff
Percolation
Groundwater

ACTIVITY
14

Water, Water Everywhere?

Summary:
Participants explore the availability of water for human use.

Grade Level:
3-8

Time:
Two 30-45 minute periods

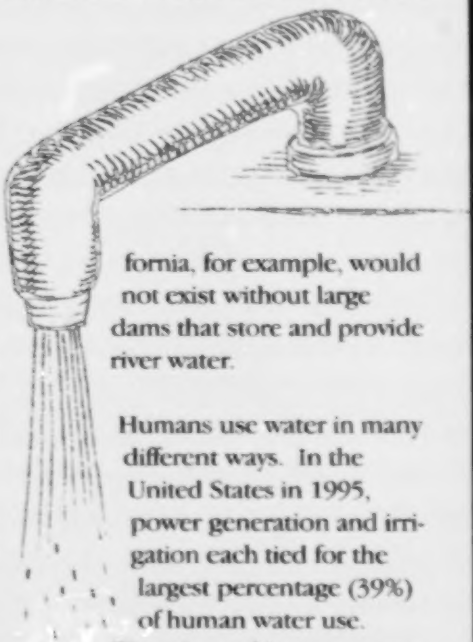
Learning Objectives:
Participants will be able to:
- ◇ Appreciate how little water is actually available for human use.
- ◇ Discuss how humans use water.
- ◇ Formulate ideas to conserve water.

Materials Needed:
- ◇ 2 large, clear plastic containers or an aquarium (at least 4 gallons)
- ◇ 2 or 3 smaller buckets or other containers (1 gallon or less)
- ◇ 2 or 3 measuring beakers (or measuring cups)
- ◇ Calculators
- ◇ Several water droppers
- ◇ World map
- ◇ Reference materials, and/or chart, (p.111)

Background:

Water is a **finite resource**, that is, the water we have on the planet is all we have. We cannot make more. So, it's possible that the glass of water a person drinks today may have been in a dinosaur's intestine millions of years ago. One of water's unique characteristics is its versatility; it exists on Earth in many different forms, often changing from one state to the next (liquid to solid, solid to liquid, liquid to gas, gas to liquid).

Ninety-seven percent of the Earth's water is ocean water, as yet largely unusable to humans for drinking, sanitation, cooking, or growing crops for food. Two percent is frozen in icecaps and glaciers. Another small portion consists of salty inland seas and lakes, soil moisture, and the atmosphere, which leaves less than one percent available for human domestic use. This small portion of the water supply consists largely of underground reservoirs of water called **ground water**, but also includes the small amount in freshwater lakes and rivers. Oddly enough, it is from rivers, the smallest (0.0001%) portion of Earth's water supply that humans obtain most of their water. This supply is unevenly distributed across the Earth. Arid and semi-arid regions, which receive little precipitation, build dams to store what little water is available. The large cities of California, for example, would not exist without large dams that store and provide river water.



Humans use water in many different ways. In the United States in 1995, power generation and irrigation each tied for the largest percentage (39%) of human water use. Water is used in power generation largely to cool the electricity-generating elements, though there is also hydroelectric power, which generates power as water flows over large turbine blades. Irrigation accounts for such a large percentage because so many crops grown in the U.S. would not thrive as well with only water they receive from rainfall (many areas that grow crops receive little rain). Other water uses include public water supply, which accounts for most drinking water and domestic uses (e.g., washing the dishes, laundry, the car, watering the lawn), industrial and mining use, water for livestock, and commercial use. Wastewater treatment is another important use of water for humans, though it is not counted in human water consumption because it deals with water that has already been used.

Water, Water Everywhere?

ACTIVITY
14

What to Do:

1. Introduce the activity by asking participants, ***Where in the world is the most amount of water found?*** (The oceans.) ***Where are other places water can be found?*** (Icecaps, ground water, inland lakes and seas, freshwater lakes, the atmosphere, in soil, rivers and streams.) Write, or have participants write the answers on a board or a large piece of paper. Next, have them brainstorm the order in which water on Earth exists, from greatest volume (oceans) to the least volume (rivers and streams).

2. Tell participants that for the purposes of this activity, the group as a whole will begin with 12 liters (about 3.2 gallons) of water, which will represent all of the water on Earth. The group should have the measuring beakers (or measuring cups) handy at the start of this activity. Piece by piece, they will remove different bodies of water that are effectively not available for human use. Each time they remove a "body of water," they should place the water in a separate container.

FIGURE 1

Volume in Metric
(in U.S. Cooking Measure;
12 liter source)

Oceans-11.6 l (49 cups)
Ice Caps/Glaciers-260 ml (1 cup, 1 TBS)
Ground Water-73.2 ml (1/3 cup, or 5 TBS)
Freshwater Lakes-1.1 ml (1/4 tsp)
Inland Seas-1.0 ml (1/4 tsp)
Soil Moisture-0.6 ml (1/8 tsp)
Atmosphere-0.1 ml (tiny drop)
Rivers & Streams-0.01 ml (unmeasurable)

3. Ask participants to first remove water that represents the ocean. See Figure 1 for the approximate amount of water they should remove. Have participants sit or stand in a circle around the "world's water supply." They should decide with which measuring beaker or cup they will begin, and then should each take turns (and pass the beaker/cup to the next participant) to do their part to remove the water. Count for them, or have them count along to make sure the right number of units is removed. Have them dump their full cups into another gallon or large container.

4. Next, they should remove the water stored in icecaps and glaciers, then inland seas, then (if it is possible at this point) a tiny bit for soil moisture and the atmosphere combined. As the water bodies become progressively smaller, allow participants to decide to use different measuring beakers, cups, or water droppers to extract the water.

5. When all these are done, ask, ***What is left?*** Tell participants that humans can use only about what they see left in the large container, less than 1% of the world's water! Add to that the fact that most water used by humans is from rivers and streams, which is only 0.0001% of all the water on Earth! Challenge participants to think about how they would have extracted 0.0001% of the water they had in the large container. Ask participants, ***How do humans get enough water?*** (Some examples: Dams contain water so that it can be easily extracted, pipelines and aqueducts move water to a particular place to be used, wells are drilled to extract ground water.)

6. After participants have discussed the small amount of water available for humans to use, ask them, ***What do people do with the water we use?*** Have them create a list (see examples below).

Domestic uses: cooking, cleaning, teeth brushing, bathing, to flush toilet, watering lawn, etc.
Commercial uses: restaurants, car washes, public restrooms, etc.
Industrial uses: mining, for cooling large engines, etc.
Electricity: cools power generators, runs hydroelectric dams
Irrigation: agriculture, livestock

Ask, ***Where do people get this water?*** Have participants brainstorm a list (see examples below).

- Public supply (largely from river- or stream-fed reservoirs)
- Well water (from ground water)

BEST COPY AVAILABLE

- Cisterns or other rain-catching devices (largely individuals; this practice is rare)

7. Wrap up the activity by asking participants, *How can we do all this with so little of the Earth's water? What does this mean to us on a daily basis? If we have so little water, what do we do if it is polluted? What are some positive steps we can take to conserve water and prevent water pollution?*

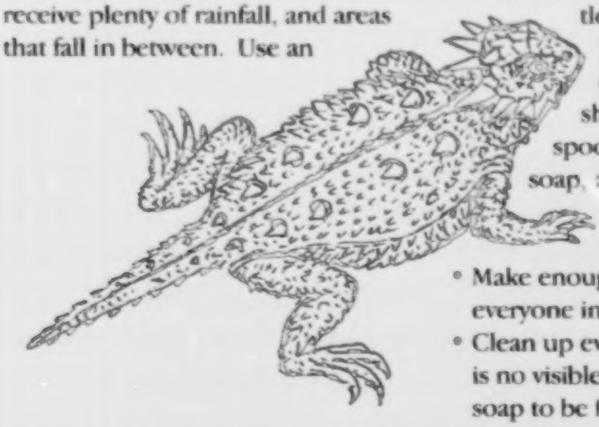
***Extension:** If there is time, have participants test out ways they can conserve water first-hand by doing the following activity.*

1. Ask participants, *How is this water distributed? Do people in the desert have the same amount of water as those living near a large freshwater lake?* Ask them to identify areas of the U.S. and the world that are arid or semi-arid, those on the other end of the spectrum that receive plenty of rainfall, and areas that fall in between. Use an atlas if necessary. Ask , *What do people in areas with little water resources do to function?* (Use dams to create reservoirs, develop aqueducts or pipelines to move water further, recycle used water, conserve water.)

2. Tell participants to imagine that they are going on a trip to an area with very little water. This could be somewhere widely known for its dryness such as the Mojave Desert, or it could simply be an area experiencing a hot, dry summer, and water is hard to find (the mountaintops of Pennsylvania after several weeks without rain, for example). Through the amazing advances in technology, they were able to carry with them a can of frozen grape juice concentrate (that is still frozen!). Break participants into small groups. If possible, have a volunteer oversee small groups.

3. Tell each group that, with only enough water to fill up 5 soda bottles, 1/2 a can of grape juice concentrate (have two groups share), a pitcher, a spoon, a small amount of soap, and a small measuring cup, they must do the following:

- Make enough grape juice for everyone in their group;
- Clean up everything so that there is no visible trace of grape juice or soap to be found anywhere (the pitcher, bottles, cans, etc.)
- Brush their teeth (they don't have to actually do it, they just have to have enough water); and
- Wash their hands.



***Note:** Grape juice works well because it can be a challenge to clean up after it, though any mix that calls for water (dehydrated milk, fruit punch, orange juice, etc., will work). If participants are going to drink the juice, make sure that none of them have diabetes or other dietary restrictions. Substitute a sugar-free drink product as needed.*

4. If the large container of water is clean, participants can use it for their water source, but they must make every effort to keep it clean. At the end of this activity, they should decide how to use any remaining water — relatively clean water can be used to water plants, for example.

5. Wrap up by asking participants if they were surprised by the amount of water they really needed to do everyday tasks. *Was it more or less than they expected?* Ask, *Why is it important to try to save water, even in areas that have plenty of water? What else could they do to conserve water?* Discuss the other uses of water in the United States, and around the world. *What are ways all people can conserve water?*

Water, Water Everywhere?

ACTIVITY 14

For Younger Participants Grades (K-2):

Talk to participants about where people get the water they use. Ask, *Where else is there water? Can we drink ocean water? What is bigger, the ocean or a river?* It is best if they can directly relate the availability of water to something they have experienced. To introduce this activity, ask them where in the world receives only a little bit of rainfall. *What do they think people do there?* Ask if their parents have ever had to stop watering the lawn or washing the car because of a drought, i.e., when there has not been enough rain. Then ask how else they could conserve water. Lead participants through the extension activity above, but use 12 liters (3.2 gallons) and several other containers for the whole class instead of splitting participants into groups. After they have completed the extension activity above, review some of the concepts of conserving water.

For Older Participants (Grades 9-12):

Ask participants to look at a world map. *How is a great deal of the Earth's freshwater distributed? Which parts have more water? Which areas have very little water?* (For example, the Great Lakes in North America have a lot of freshwater, while deserts like the Mojave in some of the western states, and the Sahara in northern Africa are very dry.) Ask, *Where is the nearest freshwater source to you? Do you live in a dry or water-rich area?* Ask participants to explain their answers. Have these participants do a project similar to the extension activity, but have them help cook a meal that uses water, like macaroni and cheese.

Note: *This will require having very responsible participants AND volunteers to oversee small groups. Any boiling of water should be carefully supervised. If participants would like to simulate the water requirements of a community, they should also set aside a large amount (on average, about 6 times as much for all domestic tasks combined!) of water for irrigation and electricity. Have them determine the amount of water they need for their project, but make sure they are aware of how much water they are using. Groups should use small containers to get water.*

Questions:

- How much of the Earth's water supply is available for us to use?
- What areas of the Earth have less water for human use than other areas?
- How do people use water?
- How can we conserve water?

Adaptations:

Refer to general adaptations on pages 11-16.

Hearing Disabilities:

- Model each step of the experiment as you explain the directions.
- Use an empty glass to help illustrate the concept of finite, explaining that there is no "recipe" for water — once it is gone, it is gone.
- Create a poster of the Earth's water supply for participants to follow as they do the experiment. Use pictures of each of the items (i.e., oceans, ice caps, lakes, etc.) and pictures of the corresponding measurement devices.
- Have a picture of the Earth on the "world's water supply" container to help reinforce learning.
- Have the sign language interpreter narrate the action of the activity as needed.
- Encourage active participation in the discussion.

Learning/Cognitive Disabilities:

- Model each step of the experiment as you explain the directions.
- Use an empty glass to help illustrate the concept of finite, explaining that there is no "recipe" for water — once it is gone, it is gone.
- Create a poster of the Earth's water supply for participants to follow as they do the experiment. Use pictures of each of the items (i.e., oceans, ice caps, lakes, etc.) and pictures of the corresponding measurement devices. Do not use

metric measures unless the group is familiar with them. Simplify as needed.

- Use measuring cups with handles instead of measuring beakers. Use different colors of measuring tools for each size for individuals who have difficulty reading (e.g., a blue cup measure, a yellow tablespoon, a white teaspoon). You can also paint the handles different colors to achieve the same effect. Correspond the colors with the drawings of the measures on the poster.
- Have a picture of the Earth on the "world's water supply" container to help reinforce learning.
- Assist participants in tracking their measurements or have partners assist as needed. Consider placing a sticker or a mark on the poster (if using) as each resource is removed to help participants keep track.
- Have participants chant "I am removing the ocean," etc. as they proceed through each water removal step of the activity.
- Encourage active participation in the discussion. If participants are having difficulty coming up with human water uses or resources give them topics like cooking and have them site examples of water use in cooking. If they are still having difficulty, give them two examples and have them choose the one that fits. For example: *Do you use water to make a can of soup or to walk a dog? Do people get water from a well or a solar panel?* Remember to allow the participants time to come up with their own answers and to have as much independence as possible.
- Have participants simulate brushing their teeth to reinforce learning.
- Complete the younger participant version of this part of the activity as appropriate.

Motor Disabilities:
Overall:

- Set water containers on a surface, such as a chair, that participants who use wheelchairs can reach down into.

For participants with limited muscle strength, coordination, or dexterity of the hands:

- Use measuring cups with handles instead of measuring beakers. Build up the handles of measuring spoons with tape, foam, or bandage material. Have partners assist with water removal as needed. Build up the handle on the spoon with tape, foam, or bandage materials as needed.
- Have partners assist as needed.

Visual Disabilities:
Overall:

- If possible, have large print and Braille measuring cups and spoons available. An alternative is to label traditional measuring cups (with handles) and spoons in permanent black marker using large, block print and in Braille.
- Narrate the action of the activity as needed.

For participants with low vision:

- Put a piece of tape at the water line each time water is removed. Mark on the tape in permanent black marker
- Have a variety of magnifiers available.

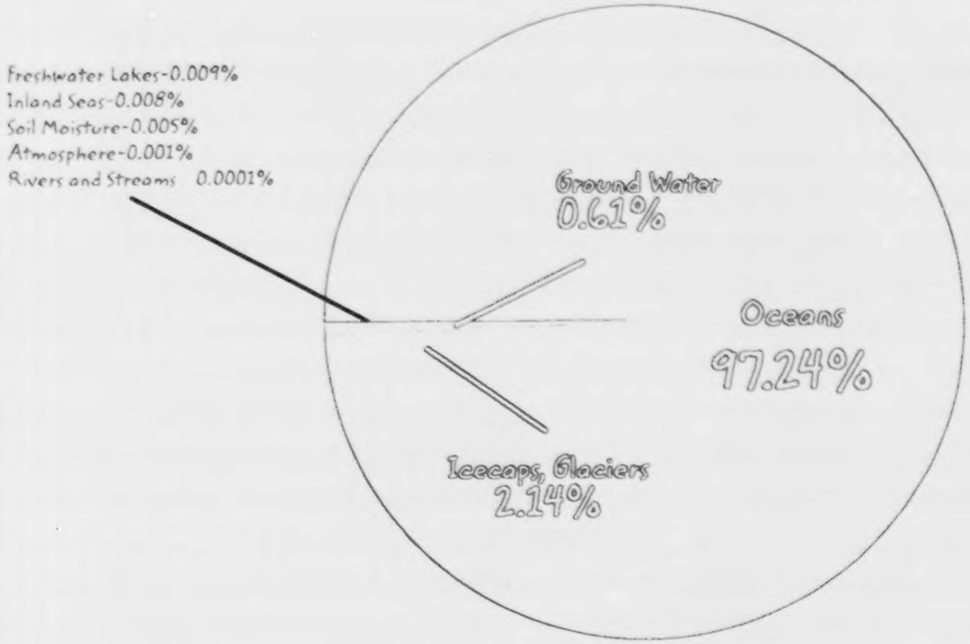
For participants who are blind:

- Have participants feel the water level of the "world's water supply" before any water is removed, and then again after each round to reinforce learning.
- Provide good orientation directions for the water removal process. Do this experiment on a tabletop and have participants stand over the containers to complete. Have the receiving container directly next to the water supply.
- Have partners assist as needed. If possible, have a relief map world map available for participants to explore.
- Have partners verbally guide participants through steps of the extension activity and assist as needed.

Water, Water Everywhere?

WORKSHEET

Earth's Water Supply

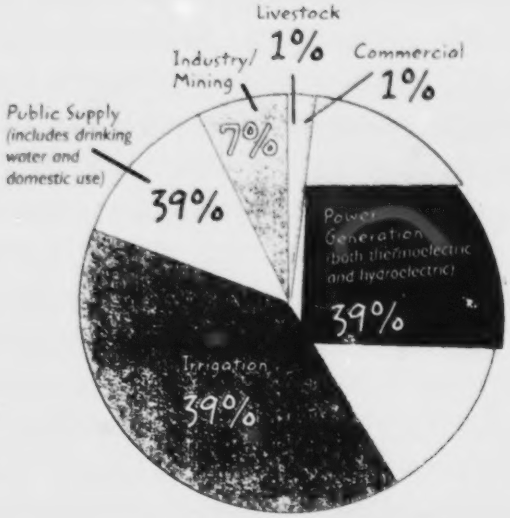


Water Usage

*In order for humans to extract ground water in a safe, cost-effective manner, the water must be fairly easy to drill to access it, and any contaminants fairly easy to remove.

**Freshwater lakes, as well as rivers and streams, are prone to various natural and man-made contaminants which must be treated and/or removed. Often, rivers are dammed to make extraction easier.

BEST COPY AVAILABLE



1995 U.S. Water Use

Source: U.S. Geological Survey, 1995.

ACTIVITY
15

The Watershed Where You Live

Summary:
Participants explore the significance of watersheds.

Grade Level:
3-5

Time:
2 sessions, 30-45 minutes each

Learning Objectives:
Participants will be able to:
- Define the term watershed
- Explore how watersheds work, and their importance.
- Locate their own watershed on a map (older participants).

Materials Needed:
- 3 sheets of card-stock paper per participant
- Spray bottles
- Non-permanent markers (different colors)
- Crayons
- Copies of the Sample Watershed worksheet
- Topographic or detailed street maps (for older participants)

Background:

When rainwater falls to the ground, it generally does one of three things. It may **evaporate** into the atmosphere as water vapor (water vapor, in turn, may condense into a cloud and rain on another place). It may **percolate** down through the soil and eventually into large underground reservoirs of water, called **ground water**. Rainwater may also simply roll off the land into streams, which roll down into larger bodies of water, such as rivers or lakes. From there, the water usually continues through waterways until it eventually drains into the ocean.

The area of land that catches water (or ice and snow) and drains into a particular waterway or body of water is called a **watershed**. For example, the Mississippi River draws water from a watershed that includes much of the land between the Appalachian and the Rocky Mountains. The Mississippi, in turn drains into the Gulf of Mexico, which has an even larger watershed (including parts of all the Gulf States and eastern Mexico).

What to Do:

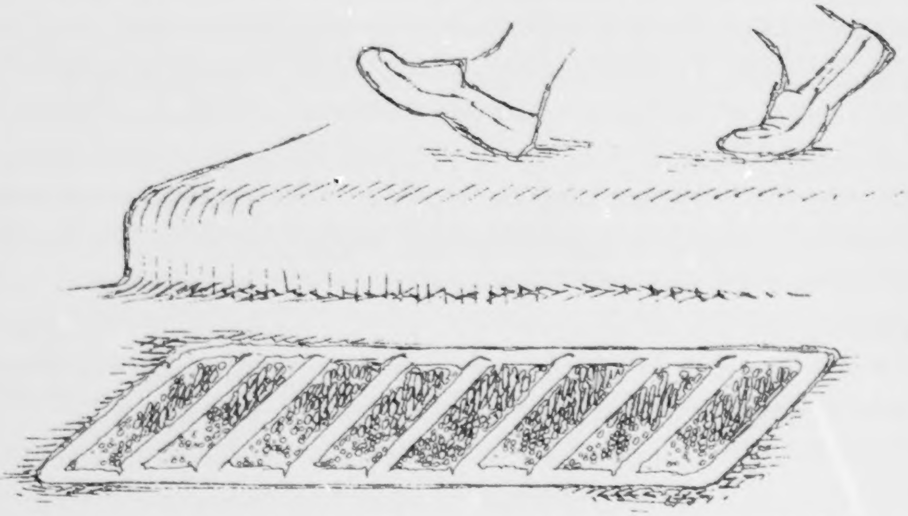
1. Ask participants, *Where do you think water goes when it rains around here?* Brainstorm and write down answers on a board or flipchart. After discussing some of the answers, explain to participants that what they are talking about is a watershed. *Do you know where our watershed is?* Tell participants that they are going to investigate their own watershed by exploring a nearby waterway, and how it connects to their surrounding area. Tell them to observe closely, because when they are finished they

Examples of Watersheds:

- The Chesapeake Bay watershed includes land from West Virginia, Pennsylvania, New York, Maryland, Delaware, and Virginia.
- The Lake Michigan watershed covers a huge area, including considerable parts of both peninsulas of Michigan, a good section of Wisconsin, and a sliver of each of Indiana and Illinois.
- The Los Angeles River watershed includes part of the mountainous region above Pasadena, and includes a great deal of East Los Angeles, the city of Los Angeles, and Long Beach.
- The Charles River watershed includes a great deal of northeastern Massachusetts, including the cities of Boston, Quincy, Newton, and Lynn.
- The watershed for a tarn (a small, snow-fed mountain lake) near the top of Mount Evans in Colorado consists wholly of the peak of Mount Evans.

will create a small model of what they saw.

2. Take participants on a short walk next to a nearby stream, river, or other body of water. Make sure to walk downstream so they can follow the flow of water. If possible, find one that converges into a larger body of water so that participants can see how water systems are connected. If participants are in a city or other developed area, consider starting at a stormwater drainage grate and walking to a nearby stream that a drainage pipe enters. While they are walking along a stream, ask, ***Which way does the water flow? Where does all the water that washes down the hill/street go when it rains?*** Get participants to think about where the stream might come from and where it goes. If participants see trash floating in the stream or snagged in low branches of nearby trees, get them to think about where the trash is coming from ***(Is it just from people dumping trash in the stream, or is something else at work here?)***.



3. During the walk or when you return from your walk, tell participants that they will soon have the opportunity to test out some of their thoughts from the walk by creating a small model watershed. Ask again, ***What is a watershed?*** (An area of land that catches rain, snow or ice and drains into a particular body of water.) Ask participants, ***What does that mean to you? What land might catch water and drain into the stream (or other body of water) we just walked along?***

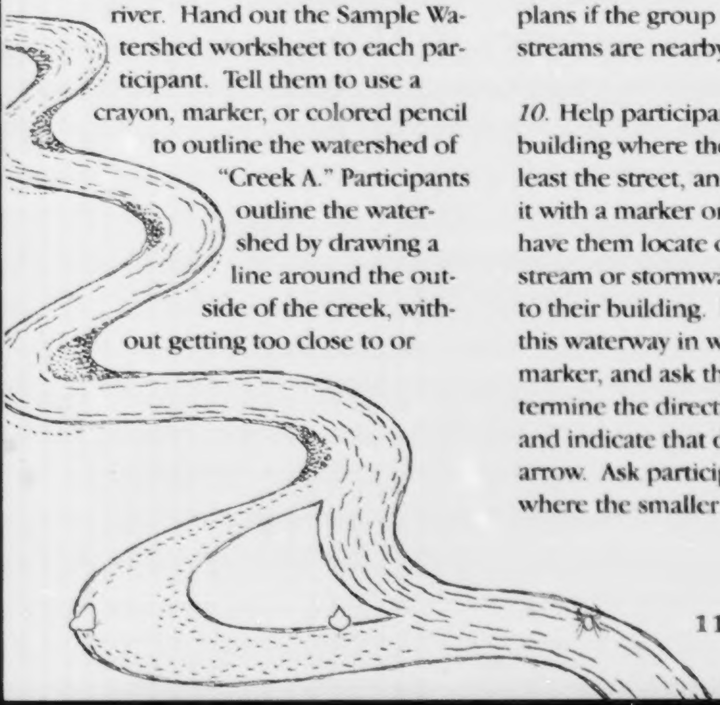
4. Have participants gather around to create model watersheds (this can be done inside or outside next to the stream, as long as the necessary materials are available). Break participants into pairs or groups of three. If possible, have volunteers oversee small groups. Tell participants that they will create model watersheds out of card stock paper simply by crumpling the paper up. Each group will need card stock paper, markers, and spray bottles. The paper should be thick and/or glossy enough that it doesn't fall apart when wet, but thin enough that it can be crumpled. It should also be at least the size of a standard (8 1/2" X 11") piece of paper, but the bigger the better. Have each small group crumple up one piece of paper into a tight ball, and then gently pull it out of the ball without smoothing out the paper entirely. The paper should look something like a mountainous relief map.

5. Participants should mark the high points on the map in pencil or crayon. These are the hill- or mountaintops. Next, have them find the lowest points and creases, and mark these in a different color pencil or crayon. These are the valleys. They should follow the valleys with their pencils or crayons so that they are clearly shown. Next, with non-permanent markers (i.e., those that will run when the ink is wet) they should connect the high points without crossing into the valleys. These are the ridgelines, and generally mark the boundary of one watershed from the next. A drop of water, then, should roll on one side and enter one watershed, or roll the other way and enter another watershed; the ink will show this pattern. If participants would like to add things like a small town, roads, trees, etc., they may do so in crayon

or pencil. Ask participants to come up with their own hypotheses as to what will happen to their model watershed if it is sprayed with water. In particular, have them think about where the water will go.

6. Have participants gently spray their model watersheds with the water bottles. Ask them to observe the direction of water flow and any patterns they see. After a few minutes, discuss with the group what happened. Ask, *How is the walk we took by the stream connected to what we just did with the model watersheds? What watershed do we live in?*

7. Have participants set the spray bottles and watershed models aside. Take a break if necessary. Next, tell participants that they will have a chance to guess the boundaries of watersheds on a sample map of a river. Hand out the Sample Watershed worksheet to each participant. Tell them to use a crayon, marker, or colored pencil to outline the watershed of "Creek A." Participants outline the watershed by drawing a line around the outside of the creek, without getting too close to or crossing other streams or other bodies of water.



8. Have participants follow the same procedure with "Stream B" and finally, to "River C." They should use a different color for the three different waterways. If they would like, participants may name the different waterways. Ask participants, *Why this activity is generally accurate, but not precise? What determines the outline of a watershed?*

9. When participants are comfortable with the concept of a watershed, pass out a copy of a detailed map of your area. The map should include streams, rivers, and other bodies of water, and should be detailed enough that they might be able to find the building where they meet (city maps and realtor maps, if available, are good for this. Contact a city planner for stormwater system plans if the group is in a city and no streams are nearby).

10. Help participants locate the building where they meet, or at least the street, and have them circle it with a marker or crayon. Next, have them locate on the maps the stream or stormwater drain nearest to their building. Have them color this waterway in with crayon or marker, and ask them to try to determine the direction of water flow and indicate that direction with an arrow. Ask participants to find where the smaller stream flows. Have them color in all the waterways connected to that stream, always going from smaller waterways to larger ones. They should continue to do this until they reach a major waterway or they go off the map. Once they have done this, have them locate the watershed of the largest waterway they found. They can do this by taking a dark marker or crayon and outlining the area of land outside all the streams and/or rivers that flow into the major waterway, without crossing over any other streams or rivers.

11. Ask participants, *What is the name of our watershed?* They can determine this by looking at the different waterways into which the nearby land would drain. So, if their building is near a stormwater drain that pours into the Peter Canyon Creek, which goes into the San Diego Creek, which heads into the Newport Bay, they are a part of at least three watersheds; the Peter Canyon Creek watershed, the San Diego Creek watershed, and the Newport Bay watershed. Wrap up by reviewing with participants how water flows (generally, downhill, and from smaller bodies of water to larger bodies of water), and the definition of a watershed (an area of land that catches water, snow, and ice and drains into a particular waterway or body of water).

12. Ask participants, *What does this mean to you? What happens if*

your car leaks oil on your driveway —where will that oil likely end up after a rain? How are you connected to your watershed, and therefore your streams and rivers?

For Younger Participants (Grades K-2):

Younger participants may have trouble with the abstract qualities of the watershed map in Steps 6-9, and may better understand the exercise if they use clay or dirt to create a model than a piece of paper. Start with a short walk along a nearby stream, and have them build a clay model of a streambed flowing downhill to a larger streambed. They may pour water on this model to test it out (see Making a Model Streambed on page 97). Then, show participants a map of the area, and have several of them trace their fingers along the path of nearby waterways, naming them as they go. So, if participants lived in the Newport Bay watershed, as shown above in Step 9, someone would name the Peter Canyon Creek and trace their finger down along it to the San Diego Creek, which they would name, and so on until they reached Newport Bay. Younger participants will appreciate the name of the watershed(s) to which they belong, and can compare this to their street address (building number on a street, which is in a part of a city, which is in a state…).

For Older Participants (Grades 6 and Up):

1. After participants have completed Steps 1-5 above, have them complete Steps 6-9 on either the watershed map below or on a topographic map that clearly has high and lower altitudes (try the Boulder, Colorado USGS quadrangle map, for instance). Information on USGS maps can be found at www.usgs.gov, though topographic maps may be found at local outdoor recreation outfitters.

***Note:** A lot of detail can be also found on city street maps or real estate map books. They will not have the topographic details, but may include and label streams, rivers, lakes, etc.*

With topographic maps, discuss how each contour line on the map indicates a change in elevation, and how they are marked at certain intervals to indicate the elevation above sea level. A lot of lines close together indicates a steep slope, lines far apart indicate a gradual incline. Generally, blue lines indicate a stream (however, see the map key to be certain), and if participants look at how the contour lines are crossing the stream, they may be able to discern which way the stream is headed.

2. Have participants identify at least three different watersheds by drawing lines between streambeds, without crossing over high points, ridgelines, other streams, or other watershed boundaries. Laminating topographic maps and using non-permanent markers allows participants to correct mistakes and reuse maps.

3. After they have located watersheds on the map supplied, or on a map as mentioned in Step 1 in this section, have participants look at a topographic or highly detailed street map of their own region. Have participants locate their residence or current location (i.e., the school or other building where they meet). Then, have them locate what watershed they are in. Have them start with the smallest stream and work their way up as far as the maps allow them to go. Ask participants, *Why is it important to know what watershed you are a part of? What can you do to help your streams and rivers stay healthy?*

Questions:

- What is a watershed?
- What watershed do you live in?
- How do the actions we take in our watershed affect the health of nearby ecosystems?

ACTIVITY
15

The Watershed Where You Live

Adaptations:

Refer to general adaptations on pages 11-16.

Hearing Disabilities:

- Have a set meeting place for the outside portion of the activity in case anyone gets separated from the group.
- Position yourself and the interpreter on the trail so participants can see you for further directions.
- Demonstrate each step of the model watershed process and other directions as you explain them.
- Have an example watershed model, complete with appropriate markings available for participants to see.
- Encourage active participation in the discussion.

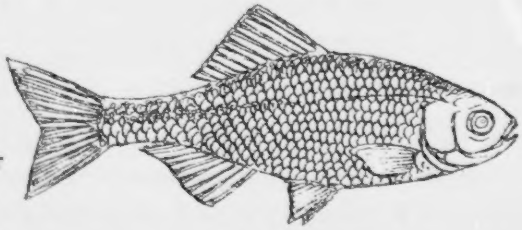
Learning/Cognitive Disabilities:

- Have a set meeting place for the outside portion of the activity in case anyone gets separated from the group.
- Demonstrate each step of the model watershed process and other directions as you explain them.
- Have an example watershed model, complete with appropriate markings available for participants to see.
- Have partners assist participants in marking items correctly on their models and the worksheet as needed.
- Have participants gently sprinkle water from their fingertips instead of using a spray bottle for better control.
- Assist participants in forming their hypotheses by asking them, *What will happen to your model watershed when you add water?* Remind participants of their hypotheses after they have done the experiment as needed to help them reach their outcomes.
- Have participants complete the younger participant version of the activity as appropriate. You can also complete Steps 1-8 only, simplifying as needed.

Motor Disabilities:

Overall:

- Research your area ahead of time for an accessible waterway for the outside portion of this activity.



- Raise the height/angle of the work surface as needed.

For participants with limited muscle strength, coordination, or dexterity of the hands:

- Build up pencils/markers with foam, bandage material, or tape as needed. Have partners assist in marking map as needed after the participants have identified the appropriate places.
- Have pre-crumpled pieces of paper available for participants to choose from as needed.
- Have participants who have difficulty operating a spray bottle drop water from their fingertips instead. Assist as needed.
- Have partners assist participants in marking items correctly on their models and the worksheet as needed.

Visual Disabilities:

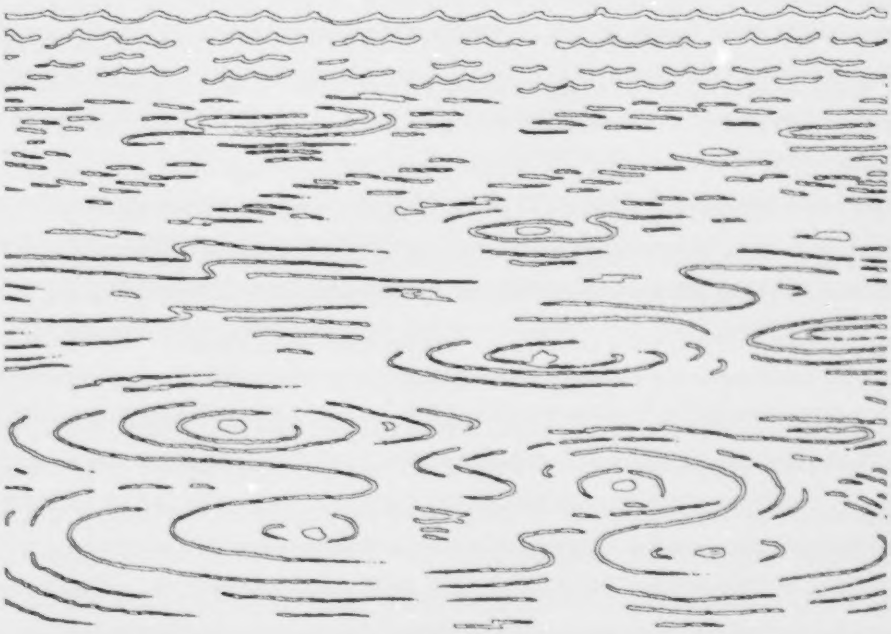
For participants with low vision:

- Create a large print version of the worksheet; consider doing this on a legal-sized piece of paper. Outline all the bodies of water in thick, dark lines.
- Have participants create their model using a legal-sized piece of paper or larger. Provide non-permanent markers in contrasting colors.

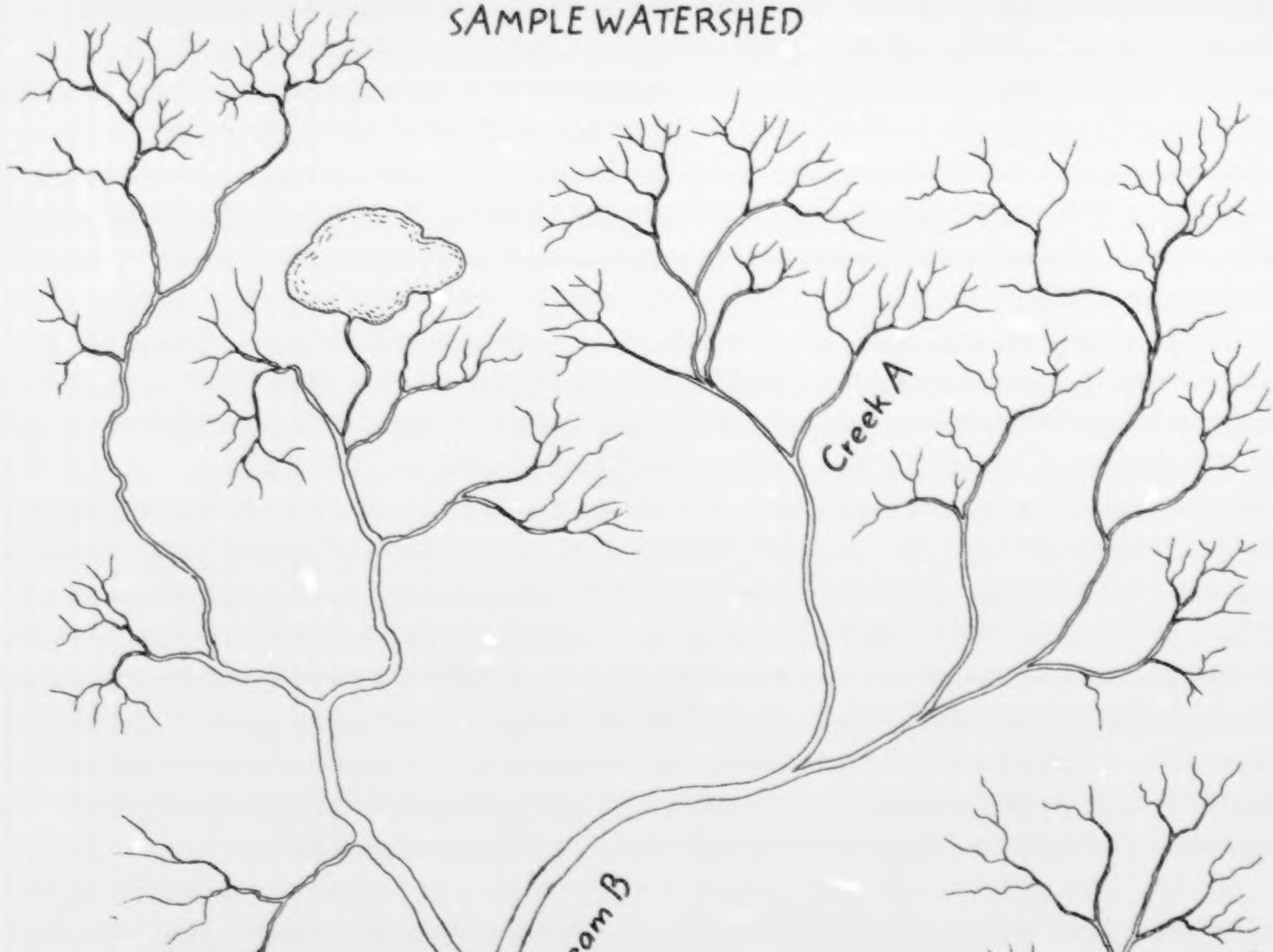
- Provide a variety of magnifiers.
- Enlarge small sections of the area map for use in Steps 9-10 or use relief maps as needed. If it is not possible to get a relief map of your area, complete the steps on a different area to illustrate the concepts. Inform participants of the name of watershed where they live if they do not know.

For participants who are blind:

- Have participants create 3-dimensional models watersheds out of clay. Have them feel their models before water is added and then afterwards to note in which directions water has run (areas will be damp), and where water collects.
- Have participants gently sprinkle water from their fingertips instead of using a spray bottle for better control.
- Have partners verbally guide participants through the activity and assist as needed. Encourage them to vividly describe what is happening in the watershed model as the water is added.
- Create a tactile version of the worksheet for Steps 7-8 using different pieces of fabric for each of the bodies in the watershed. Label each body in Braille. Have them explore the map and create appropriate circles with strips of yarn. Assist as needed.
- Use relief maps (i.e., 3-dimensional, raised maps) for Steps 9-10. If it is not possible to get a relief map of your area, complete the steps on a different area to illustrate the concepts. Inform them of the name of watershed(s) where they live if they do not know.



The Watershed Where You Live


SAMPLE WATERSHED
Creek A
Stream B
River C

118

Plant Life: Not Easy Being Green

SECTION 3

BEST COPY AVAILABLE

ACTIVITY 16

Build A Tree

Summary:

Participants learn about tree parts by building a human tree.

Grade Level:

1-6

Time:

45 minuces

Learning Objectives:

Participants will be able to:

- ◇ Name and describe the parts of a tree.
- ◇ Explain the function of each part of a tree.
- ◇ Understand how each part is related to the others.

Materials Needed:

- ◇ Copies of the Build a Tree cards
- ◇ A poster of the tree diagram

Background:

A tree has several important parts, each of which performs a function or set of functions. To start with, deep in the center of the tree, the **heartwood** provides strength and structure. The heartwood, though sturdy, is made up of dead wood.

Down deep in the ground, the **taproot** also provides support. Though not all trees have one central taproot, generally this type of root helps to keep the tree in the soil by growing straight down into it. **Lateral roots**, on the other hand, grow out away from the tree for the same function. Both types of roots branch out into smaller **rootlets**, and eventually, to **root hairs**, which soak up water and nutrients for the tree.

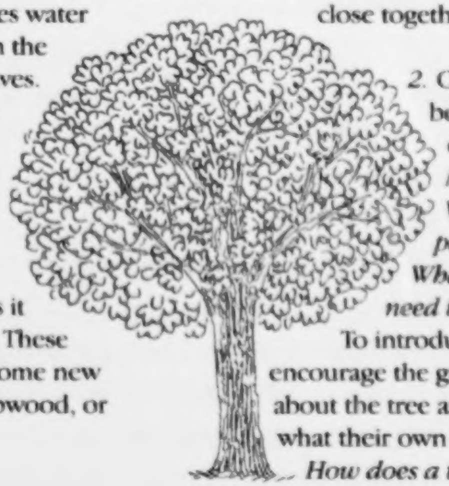
As roots do their job, the **xylem**, or **sapwood**, carries water and nutrients from the roots up to the leaves. As a tree ages, the older sapwood adds itself to the heartwood.

Cambium helps the tree to grow as it creates new cells. These new cells may become new cambium, new sapwood, or new phloem.

Just inside the outer, protective bark lies the **phloem**, which transports sap from the leaves to the rest of the tree. Sap is basically made up of sugars and nutrients dissolved in water. Phloem also carries sugars up from winter storage in the roots. And finally, we have the outside of the tree, **outer bark**. This bark is important because it protects the tree from insects, animals, disease, and even fire.

What to Do:

1. Before the group arrives, cut apart the Build a Tree cards and put them in a hat (a total of 30 slips): heartwood (1), sapwood (3-4), cambium (5), phloem (8), outer bark (10), taproot (1), lateral roots (2). Adjust the number of cards according to group size, but make sure there are at least 3 sapwood so that participants are not too close together.)



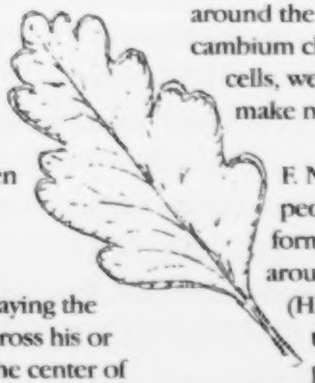
2. Copy the diagram below onto a piece of poster board. Ask participants, *What are the parts of a tree? What does a tree need to do to survive?* To introduce each term, encourage the group to think about the tree as a person and what their own bodies need. *How does a tree support itself*

Build A Tree

ACTIVITY 16

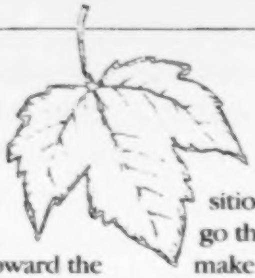
(like a skeleton)? What brings nutrients throughout its cells (like blood)? What protects it like skin? Participants will likely have some familiarity with these functions, so you can tie each one to a tree part as you introduce it. As one volunteer guesses each function and you introduce the term, ask, *Who would like to play the cambium? Who would like to play the bark?*, and so on. Hand out the pieces of paper to participants (i.e., 4 cambium, 1 taproot, 2 lateral roots, etc.).

3. Once all the cards are given out, take the group outside to a large open area and explain that everyone will work together to "build" a group tree. Each participant will play the part they have selected. Ask participants to practice any sounds or movements they think might be appropriate for their parts and then have them slowly build the tree, layer by layer:



A. Have the participant playing the part of the heartwood cross his or her arms and stand in the center of the play area. This participant represents the heartwood of the tree.

B. Next have the participant playing the taproot sit down at the foot of the heartwood. This person represents the deep taproot that most trees have.



C. Have the lateral roots lie down on their backs, spreading out from the taproot with their feet toward the heartwood. (Have the lateral roots make slurping sounds.)

D. Have the sapwood people join hands to make a ring around the heartwood. Position them so they stand between the lateral roots. They should face in, toward the heartwood. (Have the sapwood pretend they are drawing up water from the roots by lowering their hands, still joined, and then raising them above their heads.)

E. Have the cambium people join hands and form a large circle around the sapwood. (Have the cambium chant, "We make new cells, we make new cells, we make new cells.")

F. Next have the phloem people join hands and form a larger circle around the cambium. (Have the phloem pretend they are transporting food down from the leaves by starting out holding their arms above their heads, then lowering them and raising them again.)

G. Finally, have the outer bark people form a circle around the entire tree, facing outward and holding hands.

4. Once everyone is in position, ask the participants to go through their motions and make their sounds. The roots take up water from the soil, the sapwood transports the water up the trunk to the branches and leaves, the phloem carries food down from the leaves to the trunk and roots, and the cambium chants, "We make new cells." Let the tree do its thing for a few minutes while everyone listens to the combined effect they have made. Take photos if possible.

5. Afterward, return inside and bring out the tree diagram. Have each participant come up and put his or her label in the appropriate place on the diagram. When the labeling is completed, lead a short discussion about the tree the group built. *What did they think of it? What did they learn? Do they have further questions about a tree and its parts?*

For Older Participants (Grade 7 and Up):

Instead of building a tree out of humans, have participants create a model of the tree and its parts out of modeling clay, papier mâché or other suitable material. They should represent all parts and label them clearly. Ask participants to present their models to the group, explaining the purpose of each part.

Questions:

- What does a tree need to survive?
- What are its different parts?
- What do each of them do?

Adaptations:

Refer to general adaptations on pages 11-16.

Hearing Disabilities:

- If possible, have examples such as bark and/or a cross-section of a tree for participants to explore.
- Consider creating an interactive display of a tree to help illustrate the discussion. Make and label tree part "puzzle pieces" out of cardboard and secure them to a piece of poster board with Velcro. Draw the outline of the tree on the poster board as a guide. Give participants a labeled part and have them add these to the poster board as the functions of each part are discussed. You might have to adjust the scale of the parts to do this. (To make a more permanent version, put pieces of Velcro on the back of the cardboard parts and use a felt-covered board.)
- Demonstrate the action of each "part." Have participants try each as you go.
- As parts are assigned, have each participant identify which part they are playing on the poster to reinforce learning. Have them identify the part on the tree samples if you are using them in the activity. Assist as needed.
- Create a motion for the cambium to accommodate individuals who have difficulty speaking. Have all cambium participants make the motion and those who are able to chant "We make new cells," as they make the motion.
- Consider breaking the group in half and making two trees so the participants can observe the entire process in action.
- Have the sign language interpreter narrate the action of the activity as needed. If you have several participants with hearing disabilities you may need to post an interpreter on each side of the circle.

Learning/Cognitive Disabilities:

- If possible, have examples such as bark and/or a cross-section of a tree for participants to explore.
- Consider creating an interactive display of a tree to help illustrate the discussion. Make and label tree part "puzzle pieces" out of cardboard and secure them to a piece of poster board with Velcro. Draw the outline of the tree on the poster board as a guide. Give participants a labeled part and have them add these to the poster board as the functions of each part are discussed. You might have to adjust the scale of the parts to do this. (To make a more permanent version, put pieces of Velcro on the back of the cardboard parts and use a felt-covered board.)
- Demonstrate the action of each "part." Have participants try each as you go.
- As parts are assigned, have each participant identify which part they are playing on the poster to reinforce learning. Have them identify the part on the tree samples if you are using them in the activity. Assist as needed.
- Consider breaking the group in half and making two trees so the participants can observe the entire process in action.

Motor Disabilities:

- Modify the actions of "parts" as necessary. Have all of the participants complete any alternative movements.
- Have participants link arms or place a hand on anothers' shoulders if they have difficulty holding hands.

Visual Disabilities:

- If possible, have examples such as bark and/or a cross-section of a tree for participants to explore.
- Label the poster in large print and Braille to illustrate your points. Outline the drawing in both thick, black lines and raised lines of glue so participants can feel the different parts. An alternative is to cre-

Build A Tree

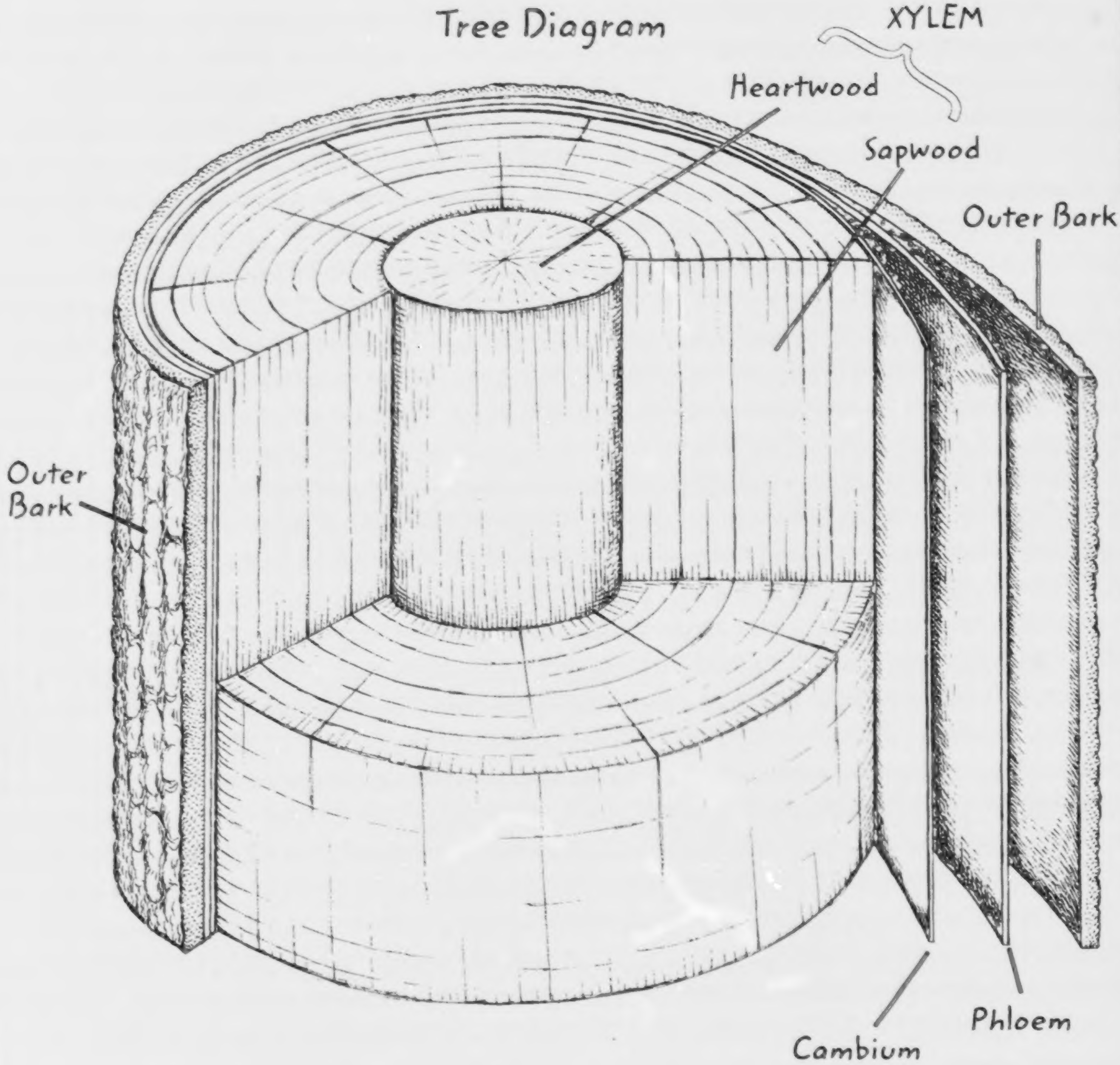
ACTIVITY 16

ate a tactile tree poster using different fabrics (e.g., corduroy, silk, felt, etc.) for each of the parts. Label the poster in large print and Braille.

- Make slips on large pieces of white paper or on index cards. Label in both large print and Braille.
- Demonstrate the action of each of the parts; verbally describe each action as you perform them.
- Have participants practice their actions beforehand. Provide guidance as needed.
- Allow participants who are blind or have low vision to feel where each person goes and the actions they make so the participants get a physical idea of the human tree.

© 1989 Cornell, Joseph. This activity was adapted with permission from Cornell, Joseph, Sharing Nature with Children II, (1989), pages 62-66. For more information, see the Sharing Nature Foundation's website at www.sharingnature.com

Build A Tree


Tree Diagram
XYLEM
Heartwood
Sapwood
Outer Bark
Outer Bark
Cambium
Phloem

Build a Tree Cards

WORKSHEET

heartwood
sapwood
sapwood
sapwood
sapwood
cambium
cambium

cambium
cambium
cambium
phloem
phloem
phloem

phloem
phloem
phloem
phloem
phloem
outer bark
outer bark

outer bark
outer bark
outer bark
outer bark
outer bark
outer bark

outer bark
outer bark
taproot
lateral roots
lateral roots

ACTIVITY
17

Tree Detectives!

Summary:

Participants practice observation skills and apply them to identifying trees in their neighborhood.

Grade Level:

3-6

Time:

45 minutes

Learning Objectives:

Participants will be able to:

- ◇ Demonstrate basic observation and identification skills.
- ◇ Describe different characteristics of two (or more) different tree species.
- ◇ Associate particular characteristics with different tree species.

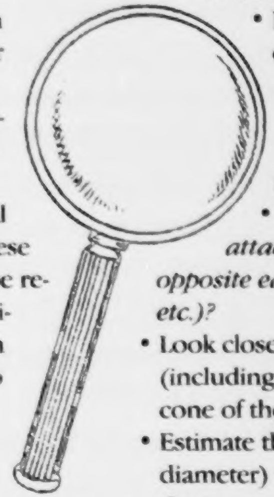
Materials Needed:

- ◇ Age-appropriate field guides, including: The Audubon Society's Nature Guides, Golden Guides, The Peterson's Field Guide Series (Peterson First Guide to Trees for younger participants), Nature Study Guild's Tree Finder, etc.
- ◇ For younger participants, large pictures of leaves and bark of trees examined
- ◇ Small notebooks and pencils

Background:

Learning how to identify trees by studying their different parts and examining their habitats can help participants become familiar with local plant life. In addition, once participants learn good observation and identification techniques, it is easier for them to transfer these skills to the study of other organisms that live in the area, such as songbirds or native flowering plants.

A good rule of thumb when working to identify trees, or most other life forms, is to observe three or more characteristics about the organism before heading for a field guide or making a final decision. At least two of these characteristics should not be related to the size of the specimen. Relying too heavily on one type of clue can lead to incorrect identification.



For example, imagine that a participant knows that the leaves of a quaking aspen tree flutter in the wind and that the tree generally grows somewhere between 40 and 70 feet tall. With nothing else to go by, he or she might spot a young 40 foot tall eastern cottonwood, (they grow to about 100 feet!) its leaves fluttering much the same way an aspen's would, and incorrectly call the tree an aspen. Examining other details, such as the bark of the tree, the leaf shape, and its habitat would make correct identification much more likely.

The following are things to consider when identifying trees:

- *Does it have needles or leaves?*
- *Does it lose its leaves in the winter (deciduous), or not (evergreen)?*
- *What is the size, shape, color and general appearance of the leaves or needles?*
- Look closely at the color, texture (scaly, smooth, ridged, fissured, etc.), thickness, and anything unusual about the bark.
- *How are the leaves attached to the stem (facing opposite each other, alternating, etc.)?*
- Look closely at the flower, fruit (including nuts and acorns), or cone of the tree.
- Estimate the size (in height and diameter) and general shape of the tree.
- *What does the crown, or top area of the tree, look like?*
- Look closely at its habitat. *What is growing around the tree? What is the area like (swampy, mountainous, near a lake, desert-like, in the tundra, etc.)?*
- Consider its geographic region. Some trees, like the live oak (found almost exclusively along

Southeastern U.S. coastlines), are confined to certain regions.

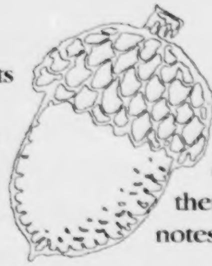
- Consider any unusual characteristics, such as the great height and width of the California Redwoods.

What to Do:

1. Find a wooded area that has at least five different types of trees, preferably native trees, to conduct the activity. If no such stand exists near the place your group meets, consider planning a field trip to a nearby park. Have volunteers help as needed.

Note: *A local arborist, either from a private tree care company or a county/municipal government office, can serve as an excellent resource for information on local tree species and identification. Consider contacting an arborist from the community to help with this activity.*

2. Ask participants, *Do you know how to tell one kind of tree from another?* Have them name different characteristics that can help them to identify trees. Brainstorm a list. With visual aids such as posters, or the accompanying handout (Leaf and Bark Clues, below), explain the different parts of a tree and how needles, leaves, and bark can all vary from one tree to the next. *What do trees need to survive? What kinds of things do they need in their habitat?* Discuss with participants the idea that, like animals, trees have different habitats and need varying levels and/or types of sunlight, water, soil, and space.



3. Tell participants that they are all going to become "tree detectives" and will have the opportunity to study different trees in detail. Each participant should have at least one partner with whom he or she will work. Make sure that at least one of the partners has a clipboard or other hard surface, copies of both the Leaf and The Whole Tree Clue sheets, and a pencil. Tell participants that these worksheets are a part of their field notebook, in which they will carefully describe different tree characteristics.

4. Begin by exploring leaves. Ask the teams or small groups to find at least three leaves on the ground, and on the leaf worksheets, to write their best description of the color(s), shape, texture, and size of each of the leaves. If participants can see how the leaves are arranged on a twig (i.e., alternating, opposing, etc.; see Leaf and Bark Clues, below), have them note that as well. They can also draw the leaves in a notebook. Once they have done this, ask all the participants to throw their leaves in a large pile and mix them up. Then, ask them to look at their notes and try to locate their own leaves. Often, participants will have studied their leaves well enough that they will be able to find the leaf without their notes; encourage them to cite evidence in their notes, too.

5. Once all participants have located their leaves, have them use field guides to try to find out what kind of tree the leaves came from. Encourage them to use several characteristics of the leaves to find their tree. Assist where necessary.

6. After they have completed their leaf hunt, have partner groups find a single tree to study. Using the Whole Tree Clue worksheet, have them take notes on every detail of the tree they can find, including the appearance of the leaves, flowers, fruits (including nuts and acorns), or needles and cones. They should also consider the color, texture, and patterns in the bark, and the general size and shape of the tree. Also ask them to consider the area in which the tree is growing. Participants can also draw a picture of their trees in their field notebook.

7. When they have finished taking notes on their tree, have them investigate what kind of tree they have found using field guides. Ask each pair or small group to make a short presentation to the whole group about their tree and any interesting information the field guides may have told them about this species.

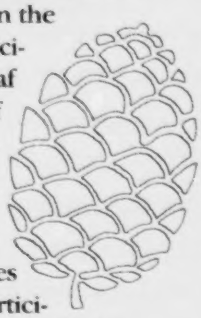
In particular, encourage small groups to discuss what wildlife might depend on the tree they have studied, and what kinds of native plants might grow nearby. Ask participants if they can find other trees of the same kind at their study site.

8. Ask participants, *Why do you think tree identification can be useful?* (Helps to evaluate the health of the forest, the kind of habitat available, the amount of biodiversity present, the kinds of trees certain animals use, etc.) Ask them what interesting things they learned about the process.

***Note:** The leaf hunt portion can also be done with nuts, seed pods, other fruits, or pine cones. Consider doing a nut/fruit/cone hunt in addition to the leaf hunt if the items are available.*

For Younger Participants (Grades 1-2):

Prior to the activity, select a number of different tree leaves and paste one of each on a sheet of paper. Make several sets of these guides, enough for one for each small group. On the tree hunt, have participants try to find a leaf that matches each of those in their guide. If the leaves can be found on the ground, have them take one that matches each sample. Ask participants to explain what is similar about the leaves they found and to describe some differences. *How can they tell which ones match?* Have participants draw pictures of the leaves they found.



For Older Participants (Grades 7 and Up):

Instead of using the Leaf and The Whole Tree Clue Sheets below, have participants create their own field notebook. Have them answer the same questions, but do so by organizing their own notes. Older participants may come up with their own method for identifying trees.

Questions:

- How can you tell one kind of tree from another?
- What characteristics can you use?
- What does this information tell you about a forest?

Adaptations:

Refer to general adaptations on pages 11-16.

Hearing Disabilities:

- Have tree part samples such as leaves, bark, and acorns for participants to explore to help illustrate your discussion and reinforce learning.
- Have a set time and place for participants to meet in case they get separated while outside. Consider marking boundary areas with flags or rope for the tree expedition.
- Position yourself and the interpreter so the participants can see you for further directions or warnings while on the trail.

Learning/Cognitive Disabilities:

- Have tree part samples such as leaves, bark, and acorns for participants to touch to help illustrate your discussion and reinforce learning.
- Create a separate sheet for each of the graphics on the handout to use as a demonstration. Create leaf shapes, etc., out of felt or other fabric so participants can feel the differences. If possible,

Tree Detectives!

ACTIVITY 17

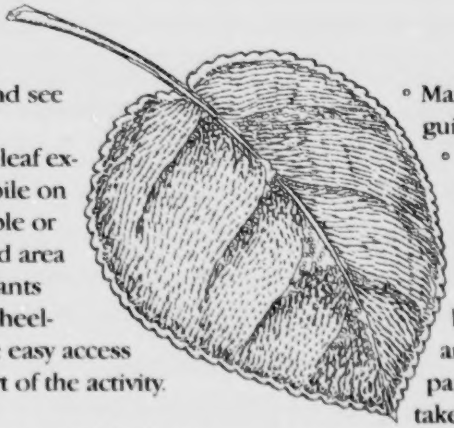
have real examples of each of the types represented on the sheet for participants to explore.

- Have a set time and place for participants to meet in case they get separated while outside. Consider marking boundary areas with flags or rope for the tree expedition.
- Give each participant a magnifying glass so they can closely examine the bark and other tree features. Encourage participants to look for fine details.
- Use simplified resource materials as needed. Consider making your own site specific field guides as suggested in the younger participant version of this activity.
- Have participants who have difficulty writing draw pictures of their tree and its parts, or have them circle the correct leaf, bark, etc., on the worksheets. Participants can color these items to help further illustrate their particular tree. Have partners assist as needed.

Motor Disabilities:

Overall:

- Choose a largely accessible site (i.e., mostly level, no standing water, etc.) for the tree expedition.
- Encourage the use of adaptive equipment such as reachers for participants to engage fully in the collection process.
- Encourage partners to engage the participants in the exploration as much as possible. This might mean having partners pick up leaves, acorns, etc., for participants to touch and see up close.
- Create the leaf exploration pile on a picnic table or other raised area so participants who use wheelchairs have easy access for this part of the activity.



For participants with limited muscle strength, coordination, or dexterity of the hands:

- If possible, provide small tape recorders for participants who have difficulty writing to record notes on their trees. Participants can also place a mark next to the correct leaf or bark on the handout.

Visual Disabilities:

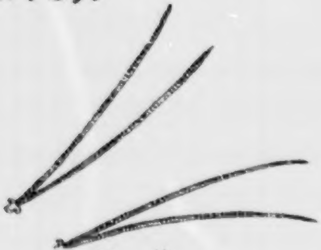
- Have tree part samples such as leaves, bark, and acorns for participants to touch to help illustrate your discussion and reinforce learning.
- Create separate sheets for each of the graphics on the handout using fabric to create the different leaf shapes. An alternative is to enlarge the graphics and outline them in heavy black lines and raised lines of glue for participants to feel. Label the sheets in large print and Braille.
- If possible, have resources available in alternative formats including Braille, large print, and audio cassette.
- Mark off the area with a guide rope.
- Provide magnifiers for participants with low vision to use to examine their trees.
- Provide large note books or clipboards and paper for participants with low vision to take notes on their trees. Provide thick black markers.
- Encourage partners to vividly describe the textures, shapes, and surroundings of the trees. Encourage the partners to guide the participants in feeling and exploring their trees and its many parts.
- If possible, provide small tape recorders for participants who are blind to record notes on their trees.
- Provide clay and pieces of cardboard for participants who are blind to make models of their leaf shape instead of drawings. If possible, have a Braille labeler for them to use.

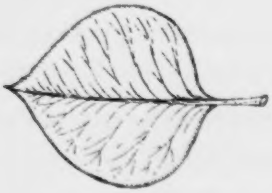
WORKSHEET

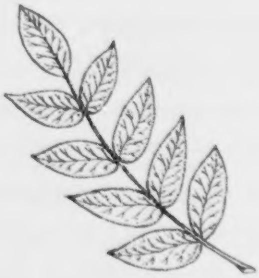
Tree Detectives!

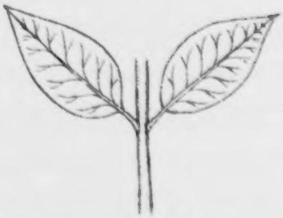
LEAF AND BARK CLUES

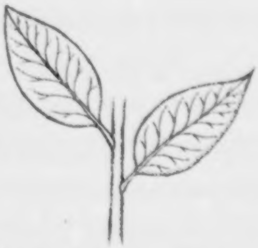
Leaves:

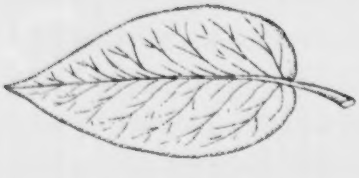

Needles

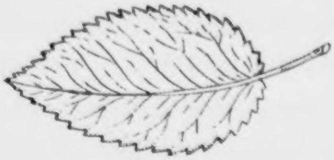

Simple leaves

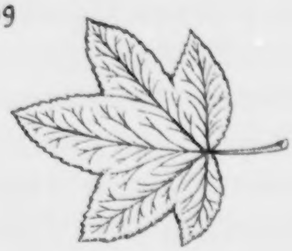

Compound leaves


Attached opposite

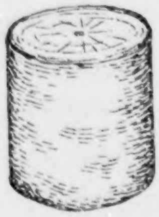

Attached alternating

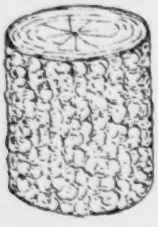

Smooth edged leaves

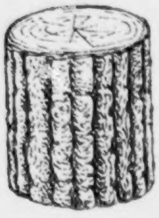

Toothed edged leaves

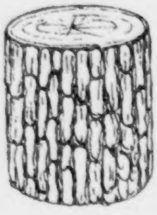

Lobed leaves

Bark:


Smooth


Bumpy


Ridged


Scaly

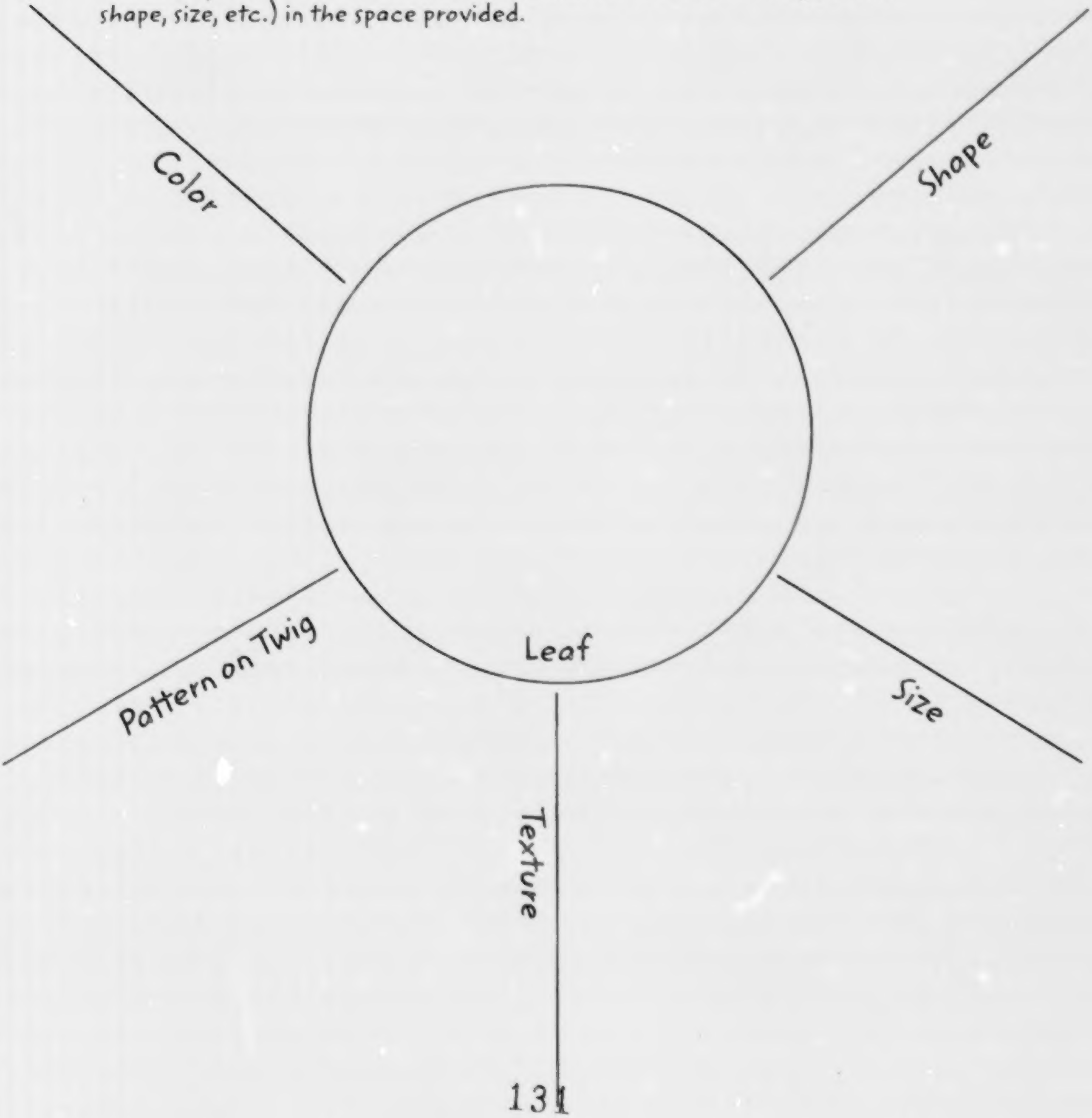
130

Tree Detectives!

WORKSHEET

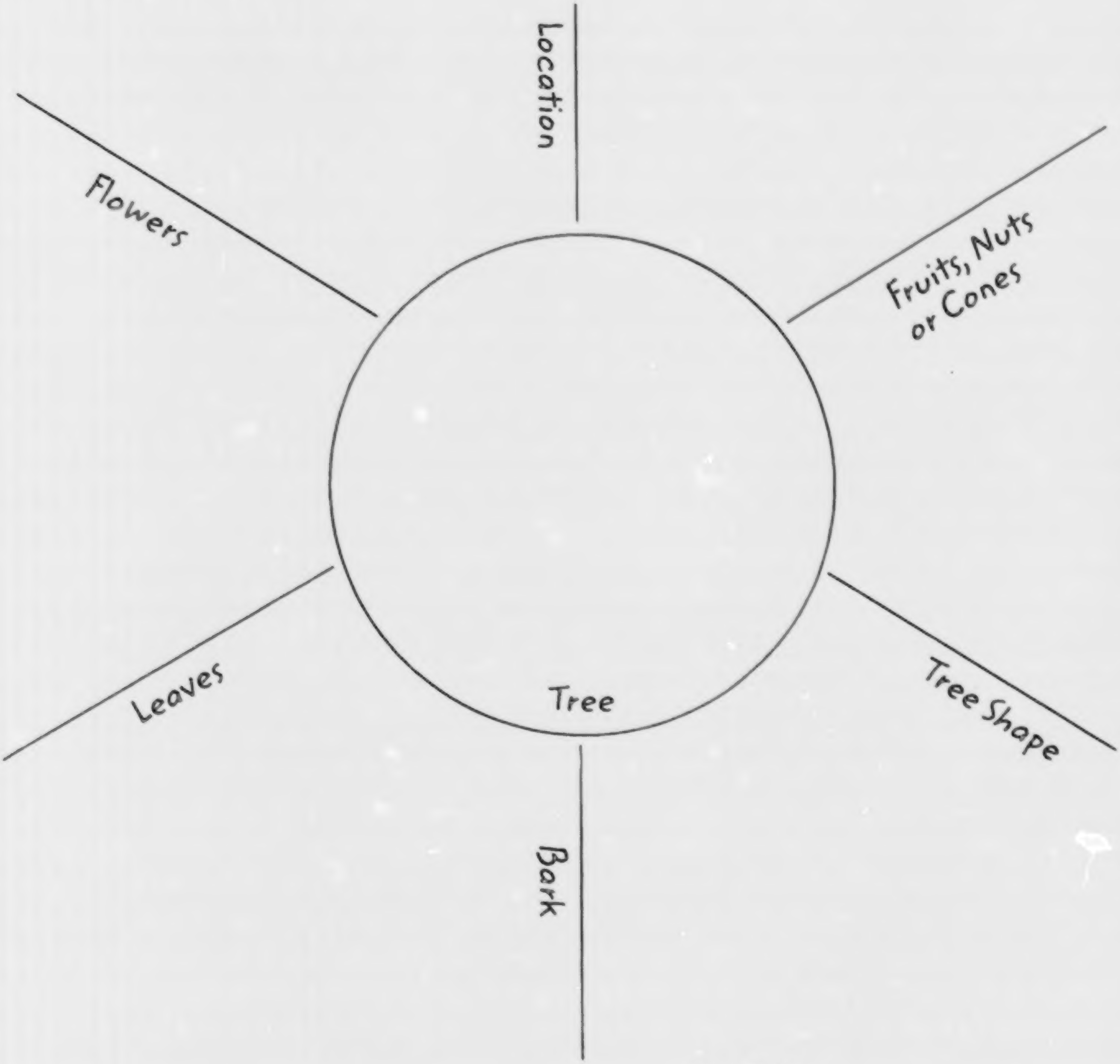
LEAF CLUE SHEET

DIRECTIONS: Draw a picture of your leaf in the middle, where it says "Leaf," and briefly describe or draw each characteristic of the leaf (e.g., color, shape, size, etc.) in the space provided.


Color
Shape
Leaf
Pattern on Twig
Size
Texture

THE WHOLE TREE CLUE SHEET

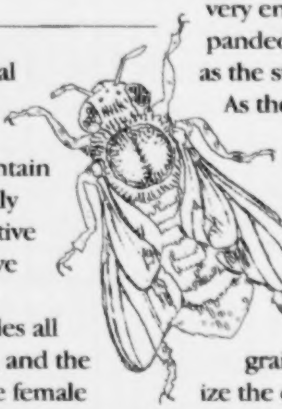
DIRECTIONS: Draw a picture of your tree in the middle, where it says "Tree," and briefly describe or draw each characteristic of the tree (e.g., location, flowers, bark, etc.) in the space provided.


Location
Flowers
Fruits, Nuts or Cones
Tree
Leaves
Tree Shape
Bark

Flower Power

ACTIVITY
18

Background:



Flowers are essential for the survival of many plant species, since they contain at least one, but usually both, of the reproductive parts of their respective plants. Normally, the **stamen**, which includes all the male flower parts, and the **pistil**, the term for the female parts, rest inside the petals.

Most flowers have **petals**, the floral leaves that act as billboards to attract pollinators like bees or hummingbirds. If present, **sepals** lie outside the petals, and usually make up some sort of outer covering or flower bud. Sometimes the sepals add to the colorful display of the petals, but often they are green and blend into the background. The stalk a single flower sits on is called the **pedicel**. All the parts sit on the tip of the pedicel, or the **receptacle**.

The stamen consists of the **filament**, a very flexible stalk, and the **anther**, which produces **pollen** and sits atop the filament. The pistil, on the other hand, has a thicker stalk, called the **style**, which connects its base to its tip. A flower's ovary is the base of the pistil. It acts as an enclosure that protects the "eggs," or **ovules**, and at some point the fertilized seeds. At the very end of the pistil lies the expanded, usually sticky, tip known as the stigma.

As they land in a flower, bees and other pollinators are dusted with pollen by the flower's anther. When they fly to a flower of the same species, they usually brush up against the stigma, where pollen grains stick and eventually fertilize the ovules below. The ovules, once fertilized and ripened, become seeds. Eventually, if everything goes well, the seeds will germinate and a new plant may grow.

What to Do:

1. Ask participants, *Do you know the different parts of a flower? What do these parts do?* Discuss and identify the parts using the labeled poster. Keep the discussion as interactive as possible, asking questions (e.g., *What does a flower need to do? How does it carry out these functions? How does it help the plant reproduce?*).

2. Review the pollination process, explaining that just as animals depend on many plants for food, plants depend on various animals for help in reproduction (e.g., bats, insects, birds).

3. If needed, explain the concept of dissection (i.e., the process

Summary:

Participants dissect a flower to examine its parts closely.

Grade Level:

3-8

Time:

45 minutes

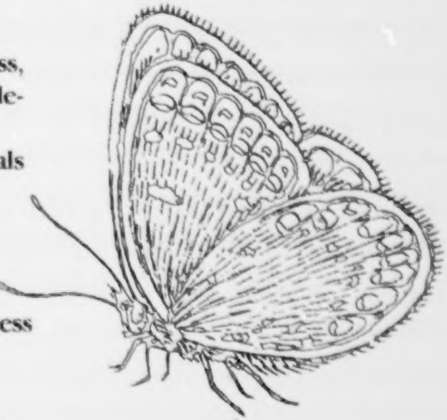
Learning Objectives:

Participants will be able to:

- ◇ Identify the different parts of a flower.
- ◇ Describe the pollination process.
- ◇ Learn or improve dissection skills.

Materials Needed:

- ◇ One flower per group (daffodil, tulip, or gladiola are easy to examine)
- ◇ Hand lenses
- ◇ Craft knife
- ◇ A large, labeled poster of a flower (use diagram below; copy in large format on a board or flipchart)
- ◇ Paper and pencils



of disassembling an organism to examine its parts) to the group.

4. Divide participants into pairs or small groups. Give each pair/group a flower to open up and examine with hand lenses.

5. For the dissection, cut the flower in half lengthwise. Participants who are old enough can do this cutting themselves; younger participants will need assistance. Have participants look for eggs/seeds in the ovary and identify each part. Have them draw and label the dissected flower in their field notebooks.

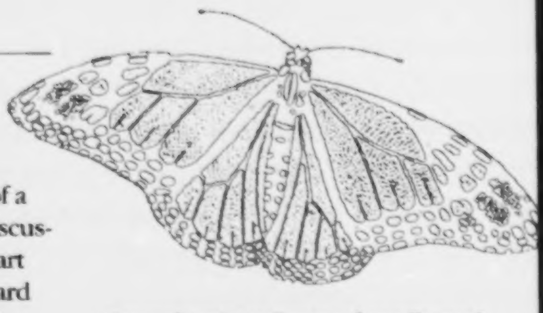
6. When all groups are finished, have each group come up and tell the group: 1) one new observation they made about flowers that they never noticed before; and 2) one question they have about flowers that occurred to them from this activity. Have each group share their observations and questions with the whole group.

Questions:

- What are the parts of a flower?
- What does each do?
- How do flowers reproduce?

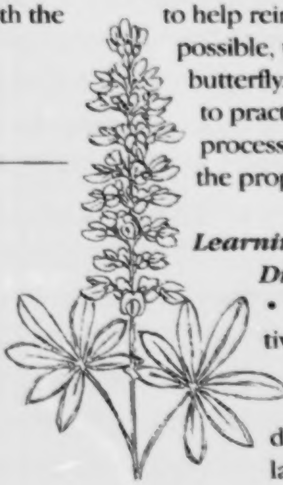
Adaptations:

Refer to general adaptations on pages 11-16.



Hearing Disabilities:

- Create an interactive display of a flower to help illustrate the discussion. Make and label flower part "puzzle pieces" out of cardboard and secure them to a piece of poster board with Velcro. Draw the outline of the flower on the poster board as a guide. Give participants a labeled part and have them add these to the poster board as the functions of each part are discussed. (To make a more permanent version, put pieces of Velcro on the back of the cardboard parts and use a felt-covered board.)
- Use plastic/silk flowers to help illustrate the parts of a flower.
- Demonstrate the pollination process using the silk flower and an item to represent a pollinator to help reinforce learning; if possible, use a plastic bee or butterfly. Allow participants to practice the pollination process using the props.



Learning/Cognitive Disabilities:

- Create an interactive display of a flower to help illustrate the discussion. Make and label flower part "puzzle pieces" out of cardboard and secure them to a piece of poster board with Velcro. Draw the outline of the flower on the poster board as a guide. Give participants a labeled part and have them add these to the poster board as the functions of each part are discussed. (To make a more permanent version, put pieces of Velcro on the back of the cardboard parts and use a felt-covered board.)
- Use plastic/silk flowers to help illustrate the parts of a flower.
- Demonstrate the pollination process using the silk flower and an item to represent a pollinator to help reinforce learning. If possible, use a plastic bee or butterfly. If time permits, allow participants to practice the pollination process using the props.
- Have pre-printed labels available for participants who have difficulty writing.

Motor Disabilities:
For participants with limited muscle strength, coordination, or dexterity of the hands:

- Have pre-printed labels available

for participants who have difficulty writing.

- Have partners assist with dissection as needed (older participants).
- Use eyeglasses with magnifying lenses, tabletop magnifiers, or a magnifier that can be worn around the neck for individuals who have difficulty holding a hand lens.

Visual Disabilities:

Overall:

- Use plastic/silk flowers to help illustrate the parts of a flower. Give participants time to explore.
- Demonstrate the pollination process using the silk flower and an item to represent a pollinator to help reinforce learning. If possible, use a plastic bee or butterfly. If time permits, allow participants to practice the pollination process using the props.
- Create a tactile flower poster using different fabrics (e.g., corduroy, silk, felt, etc.) for each of the parts. Label the poster in large print and Braille. Connect the parts and labels with lines of raised glue or yarn.

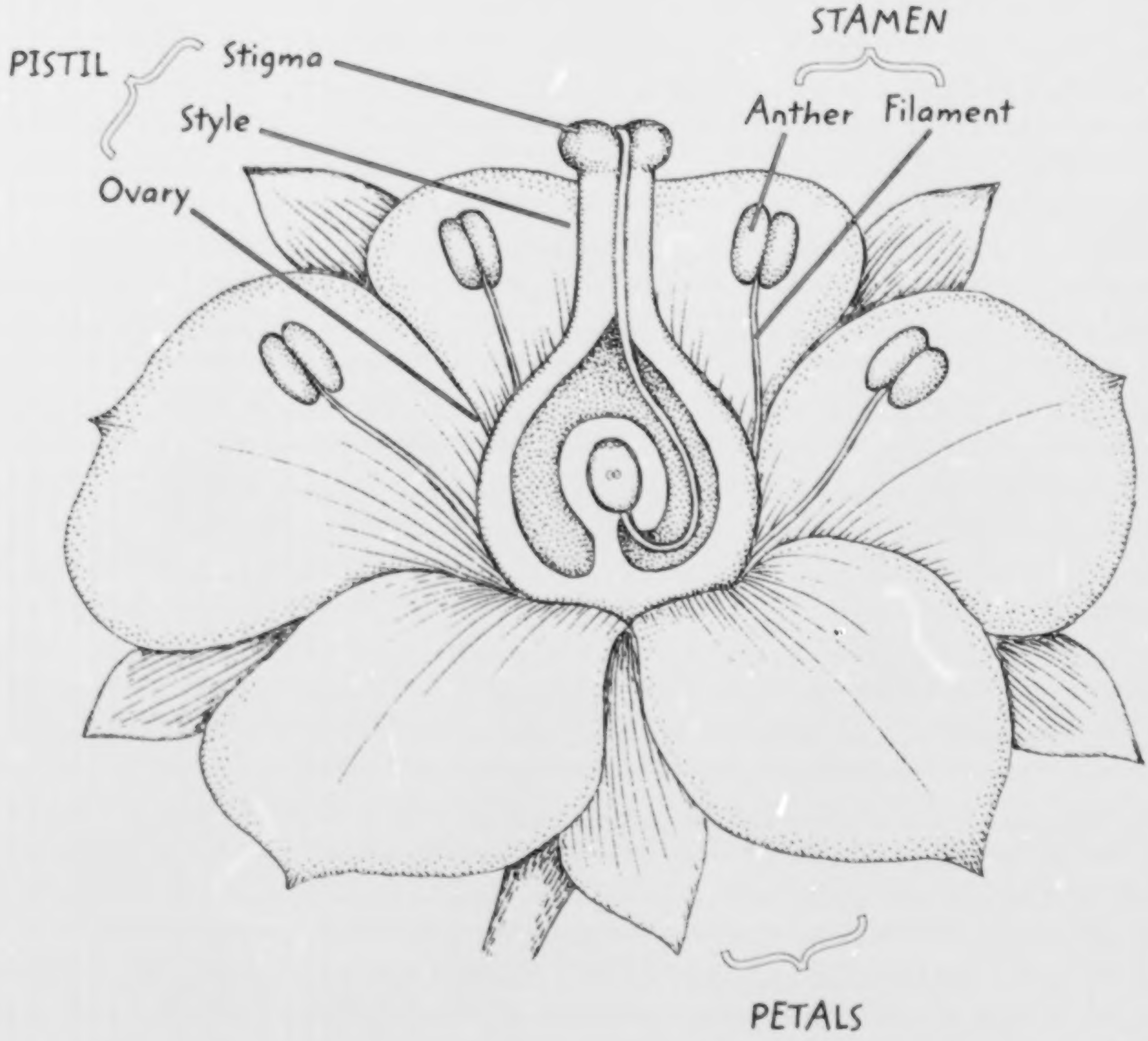
For participants with low vision:

- Use brightly colored, large flowers. Place the flowers on contrasting backgrounds (e.g., red flowers on white paper or yellow flowers on black paper).

For participants who are blind:

- Have a large flower already dissected for participants to explore. Explain each part. This can also be done with a plastic or silk flower if it is anatomically correct. Have participants model each part in clay to reinforce learning.

FLOWER DIAGRAM


PISTIL
Stigma
Style
Ovary
STAMEN
Anther
Filament
PETALS

136

Build Your Own Flower

ACTIVITY 19

Background:

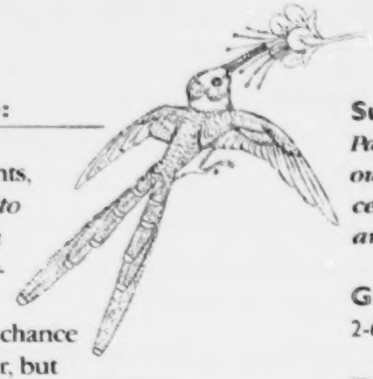
See "Flower Power" for complete flower anatomy overview.

The intricate process called **pollination** relies heavily on the participation of animals, including many different kinds of insects, (honeybees, butterflies, common flies, etc.), hummingbirds, and even some bats. Pollination occurs when **pollen grains** from the **anther** of one flower reach the **stigma** of (generally speaking) another flower from the same species.

For this transfer of pollen grains to be accomplished, animals cannot just land on a flower, but must go inside the flower where they actually come in contact with the anther or stamen. Over time, flowers have developed adaptations to ensure that the best pollinator for their species will continue to return. These adaptations include flower shape, scent, and color. At the same time, various pollinators have also adapted to ensure that they will have a plentiful food supply. Animal adaptations include sense of smell, color preference, and tongue length.

This flower-animal relationship is mutually beneficial. Flowering plants receive assistance in propagating their species, while animals receive food, usually in the form of nectar.

What to Do:



1. Ask participants, *Would you like to make your own flower?* Tell participants that they will have a chance to make a flower, but before they start, they will explore different flower parts and what those parts do. That way, they will have some great ideas to work with when they build their flowers.

2. Review the different parts of a flower with a poster-sized diagram of flower parts (see the "Flower Power" activity). Explain that over time flowers have developed adaptations to ensure that the best pollinator (one that will carry pollen onto another flower of the same species) will return again and again. Pollinators, including hummingbirds, butterflies, and honeybees have also adapted to ensure that they will have a plentiful food supply.

3. Have participants study pictures or drawings of a trumpet flower, a honeybee, a butterfly, and a hummingbird while providing the following background for each:

- The trumpet flower is red in color, has a "tube" shape, has no "landing" spot, and has little fragrance. It often grows upside-down, but it can also grow upright or facing out.

Summary:
Participants design their own flowers for attracting certain pollinators, using art materials.

Grade Level:
2-6

Time:
45 minutes

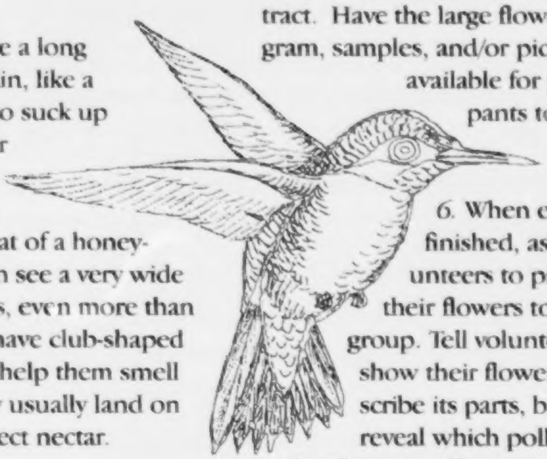
Learning Objectives::
Participants will be able to:
- ◇ Describe the complementary relationships between pollinators and the plants they pollinate
- ◇ Identify adaptations that flowers have developed to "encourage" pollination from different pollinators.
- ◇ Identify major flower anatomy.

Materials Needed:
- ◇ A large diagram of the basic parts of a flower
- ◇ Pictures, drawings, or models of: a trumpet flower, a honeybee, a butterfly, and a hummingbird
- ◇ Pictures, drawings, or silk/plastic flowers
- ◇ Markers, pencils, crayons
- ◇ Construction paper
- ◇ Glue, scissors, staplers

ACTIVITY
19

Build Your Own Flower

- Hummingbirds have a poorly developed sense of smell; are attracted to the colors red, pink, orange, and yellow; "hover" at, rather than land on, their flowers; and have a long bill and tongue.
- Honeybees have a short proboscis (this is like a tongue, used to suck up nectar and water), cannot see red, must land and crawl to get to nectar, and are attracted to sweet fragrances.
- Butterflies have a long proboscis (again, like a tongue, used to suck up water or nectar from flowers, but much longer than that of a honeybee). They can see a very wide range of colors, even more than humans, and have club-shaped antennae that help them smell and feel. They usually land on flowers to collect nectar.



4. After participants have had time to look at the pictures and process the information, ask them which of the three pollinators is more likely to access the trumpet flower's nectar. Ask the following questions as part of the discussion: *Is the shape of this flower more easily accessible to a honeybee, a butterfly, or a hummingbird? Which pollinator would be more attracted to the flower's color? Would a honeybee be lured by the trumpet flower's scent? Is there a place for a honeybee to land? Which animal would make the best pollinator for the trumpet flower?*

5. Once the participants have reached a conclusion, have them create flowers, using construction paper, markers, scissors, pipe cleaners, and/or other art materials. Ask them to keep in mind the different parts they have learned and what kind of pollinator they want to attract. Have the large flower diagram, samples, and/or pictures available for participants to use for reference.

6. When everyone is finished, ask for volunteers to present their flowers to the group. Tell volunteers to show their flower and describe its parts, but do not reveal which pollinator they hope it will attract. Have participants ask questions of the presenter and try to guess what pollinator would be best.

7. Another option is to have participants work in pairs and create a flower for their partner to reflect their "pollinator preferences." Have the participants interview each other for information including favorite color, shape, scent, and snack. Then have participants draw or create their partner's "dream flower." For fun, have them make it as unreal as possible. For example, one might create a clear, square-shaped flower that smells like vanilla and has chocolate nectar. Have each pair present their "dream flowers" to the class.

For Younger Participants (Grades 1-2):

Before the activity, create super-sized models of the flower parts out of felt or construction paper or cardboard. Make enough so there is at least one part for everyone or for every pair. Try to do this outside, if feasible. Have participants come up to the front of the group and assemble a large group flower, bringing their part with them. Call participants up by function, e.g., *What do the petals do? Where do they go?* All children with petals come up now. When the whole flower is assembled, take a photograph so everyone can see the amazing flower they created together!

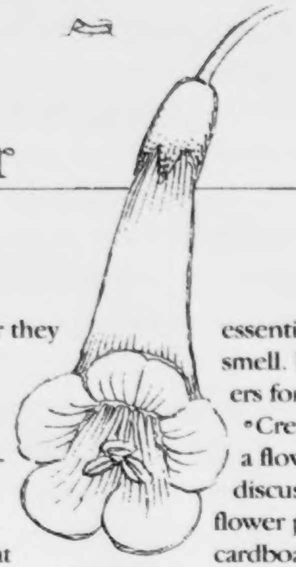
For Older Participants (Grades 7 and Up):

1. Follow Steps 1-3, above.

2. Assign the group a particular kind of flower and provide a picture and some very basic information about it, but do not mention any pollinators.

Build Your Own Flower

ACTIVITY 19



3. Break participants into small groups. If possible, have volunteers oversee small groups. Assign each group a different pollinator, at least one of which should be particularly adapted to the flower assigned in Step 2, above. For example, if the flower of the organ pipe cactus in Arizona was assigned, the pollinators to research should include either the greater or lesser long-nosed bat, which are the primary pollinators of the cactus. Have each group find out as much information as they can about their pollinator. They can find such information in field guides (Audubon Field Guides, Peterson Field Guides, etc.), encyclopedias, or websites, including NWF's site, www.nwf.org, the Arizona-Sonoran Desert Museum at www.desertmuseum.org, and many links found under "Resources" at the Xerces Society's site, www.xerces.org.

4. Based on their research, participants should decide whether or not their group's pollinator is suited to the flower assigned. They should be able to supply at least three characteristics of the pollinator or the flower to support their decision. Have them report their findings to the group. Encourage groups to use pictures or drawings of their pollinator.

5. After everyone has presented their findings, discuss with the whole group whether they agreed or disagreed with each finding.

6. Have the group create their own flowers as in steps 6-8, above. They should include at least three characteristics that would make pollination easier for a certain type of animal.

Questions:

- What are the parts of a flower?
- How do flowers attract pollinators?
- How do they differ to attract different pollinators?

Adaptations:

Refer to general adaptations on pages 11-16.

Hearing Disabilities:

- Use pictures and hands-on examples to illustrate your points. Have a variety of hands-on examples for participants to smell and touch to illustrate each of the examples in Step 4. For example, use a plastic/silk cone-shaped flower to help illustrate the trumpet flower. Create a hummingbird out of pipe cleaners or use an object such as a ping-pong ball to simulate a hummingbird; have participants simulate the pollination process to help reinforce learning. Scent cotton balls with different extracts or essential oils for participants to smell. If possible, have real flowers for participants to explore.
- Create an interactive display of a flower to help illustrate the discussion. Make and label flower part "puzzle pieces" out of cardboard and secure them to a piece of poster board with Velcro. Draw the outline of the flower on the poster board as a guide. Give participants a labeled part and have them add these to the poster board as the functions of each part are discussed. (To make a more permanent version, put pieces of Velcro on the back of the cardboard parts and use a felt-covered board.)
- Have participants who have difficulty speaking write down the answers to their partners' questions or work with the interpreter if possible. Encourage participants to actively participate in the discussion.

Learning/Cognitive Disabilities:

- Use pictures and hands-on examples to illustrate your points. Have a variety of examples for participants to smell and touch to illustrate each of the examples in Step 4. For example, use a plastic/silk cone shaped flower to help illustrate the trumpet flower. Create a hummingbird out of pipe cleaners or use an object such as a ping-pong ball to simulate a hummingbird; have participants simulate the pollination process to help reinforce learning. Scent cotton balls with different extracts or essential oils for participants to smell. If possible, have real flowers for participants to explore.

- Create an interactive display of a flower to help illustrate the discussion. Make and label flower part "puzzle pieces" out of cardboard and secure them to a piece of poster board with Velcro. Draw the outline of the flower on the poster board as a guide. Give participants a labeled part and have them add these to the poster board as the functions of each part are discussed. (To make a more permanent version, put pieces of Velcro on the back of the cardboard parts and use a felt-covered board.)
- Have pre-printed labels available for participants who have difficulty writing.
- Have pre-cut flower pieces available for participants who have difficulty cutting.

Motor Disabilities:

For participants with limited muscle strength, coordination, or dexterity of the hands:

- Have adaptive scissors available.
- Provide large glue sticks in addition to traditional bottles of glue.
- Have pre-printed labels available for participants who have difficulty writing.
- Have pre-cut flower pieces available for participants who have difficulty cutting.

Visual Disabilities:

Overall:

- Have a variety of hands-on examples for participants to smell and touch to illustrate each of the examples in Step 4. For example, use a plastic/silk cone shaped flower to help illustrate the trumpet flower. Create a hummingbird out of pipe cleaners or use an object such as a ping-pong ball to simulate a hummingbird; have participants simulate the pollination process to help reinforce learning. If possible, have real flowers for participants to explore. Scent cotton balls with different extracts or essential oils for participants to smell.

- Create a tactile flower poster using different fabrics (e.g., corduroy, silk, felt, etc.) for each of the parts. Label the poster in large print and Braille. Connect labels to parts with raised lines of glue or yarn.

For participants who are blind:

- Allow participants to make a clay model of a flower or to create one out of tissue paper and pipe cleaners. If desired, have extracts or oils available to scent their flowers.
- If possible, have a Braille labeler available for participants to use.

Adapted with permission from the "Partners in Pollination" lesson plans, created by the Smithsonian Center for Education and Museum Studies. Look for Partners in Pollination under science lesson plans on the Internet at http://educate.si.edu

Flower Hunt

ACTIVITY 20

Background:

See "Flower Power" on page 133 for additional background information.

For the following activity, it is a good idea to have available several wildflower identification guides. Explore along with the participants, but encourage them to discover for themselves.

What to Do:

1. Give a brief overview of flowers and their parts if needed, or if the group has not yet completed the "Flower Power" or "Build a Flower" activities.

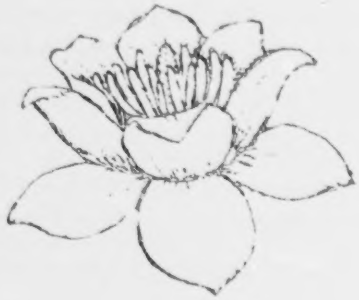
2. Select an exploration site with a large number of flowers present. Divide participants into pairs/groups. If possible, have volunteers oversee small groups.

3. Give each pair/group a Flower Hunt worksheet. Tell the participants to record their findings on the worksheet while exploring the area for flowers. Make sure to remind them not to pick any of the flowers.

4. After a set time (suggested: 30 minutes, depending on group level and the area you are exploring), all groups should come together and share information about one of their flowers. *What was the most interesting flower they found? Did they discover anything surprising?*

5. Have the participants choose their favorite flower and draw a picture of it. If desired, set up research stations and have participants use wildflower guides to help identify the flowers they saw while in the field.

Note: *All participants need to have partners for this activity! Review appropriate safety considerations (pages 17-18).*



For Younger Participants (Grades K-2):

Hand out colored squares of construction paper, either one to each pair or several depending on time available and level of students. Have participants explore the exploration area and try to find all flowers that match their color(s). When the group reassembles, have

Summary:

Participants go on a scavenger hunt to find different kinds of flowers.

Grade Level:

3-8

Learning Objectives:

Participants will be able to:

- ◇ Observe the variety of flowers in the area.
- ◇ Notice and describe differences among flowers.
- ◇ Demonstrate excellent observation skills.

Time:

1 hour

Materials Needed:

- ◇ Copies of the Flower Hunt worksheet
- ◇ Wildflower field guides
- ◇ Pencils
- ◇ Paper, markers, crayons
- ◇ Clipboards

141

ACTIVITY
20

Flower Hunt

participants share with the group how many they found of their color. *If there were a lot more of one color than another, why do they think that would be? What kind of animal pollinates those flowers?*

Questions:

- How many different flowers can you find?
- How can you identify them?

Adaptations:

Refer to general adaptations on pages 11-16.

Hearing Disabilities:

- Review the contents of the worksheet. Have examples or pictures of some of the types of flowers from the worksheet.
- Clearly mark the trail with a beginning and an end point (use string or flags).
- Have a set meeting place in case individuals get separated.
- Position yourself and the interpreter so the participants can see you for further directions or warnings while on the trail.

Learning/Cognitive Disabilities:

- Review the contents of the worksheet. Have examples or pictures of some of the types of flowers from the worksheet.
- Clearly mark the trail with a beginning and an end point (use string or flags).
- Have a set meeting place in case individuals get separated.
- Provide small tape recorders for participants who have difficulty writing or have partners assist with worksheet as needed.

Motor Disabilities:
Overall:

- Select a largely accessible site (i.e., mostly level, no standing water, etc.).

For participants with limited muscle strength, coordination, or dexterity of the hands:

- Provide small tape recorders for participants who have difficulty writing or have partners assist with worksheet as needed.

Visual Disabilities:
Overall:

- Clearly mark a trail with a guide string on one side.
- Encourage partners to be very vivid in descriptions and actively engage participants in the hunt.
- Encourage participants touch each flower to count the petals, feel their shape and texture, etc.
- Provide the list of items in large print and Braille.
- If desired, set up a table-top trail for participants that includes different flowers. Label the flowers with large print and Braille signs to encourage independent identification and exploration.
- If possible, have field guides available in alternate formats including large print and Braille.
- Provide a variety of magnifiers for participants with low vision

For participants who are blind:

- Replace the color-related question on the worksheet with tactile and scent-based questions regarding petal shape, stalk size, scent, or petal texture. (Ex: Find a trumpet shaped flower, a round flower, a flower that is over 12 inches tall, has a strong scent, etc.)
- Provide small tape recorders for participants to record their findings or have a partner assist.
- For the younger participant version, substitute number of petals, scent features, or some other identifying factor for color. For example, create cardboard cut-outs of several different shaped flowers and hand out to the participants. Have them identify how many of each type they find.

Adapted with permission of the publisher: Lingelbach and Purcell, eds. Hands-On Nature, 2nd edition. Woodstock: Vermont Institute of Natural Science, 2000.

Flower Hunt

WORKSHEET

DIRECTIONS: With your partner, try to find each of the items listed below.
After you find an item, write where you found it next to the item, but do not pick the flower!
Draw a small sketch of the flower next to its description if you can.

1. Find a flower with:
    a) petals bigger than a baby fingernail
    b) 3 petals
    c) more than 3 petals

2. Find a plant with:
    a) many flowers on one stalk
    b) a single flower on one stalk

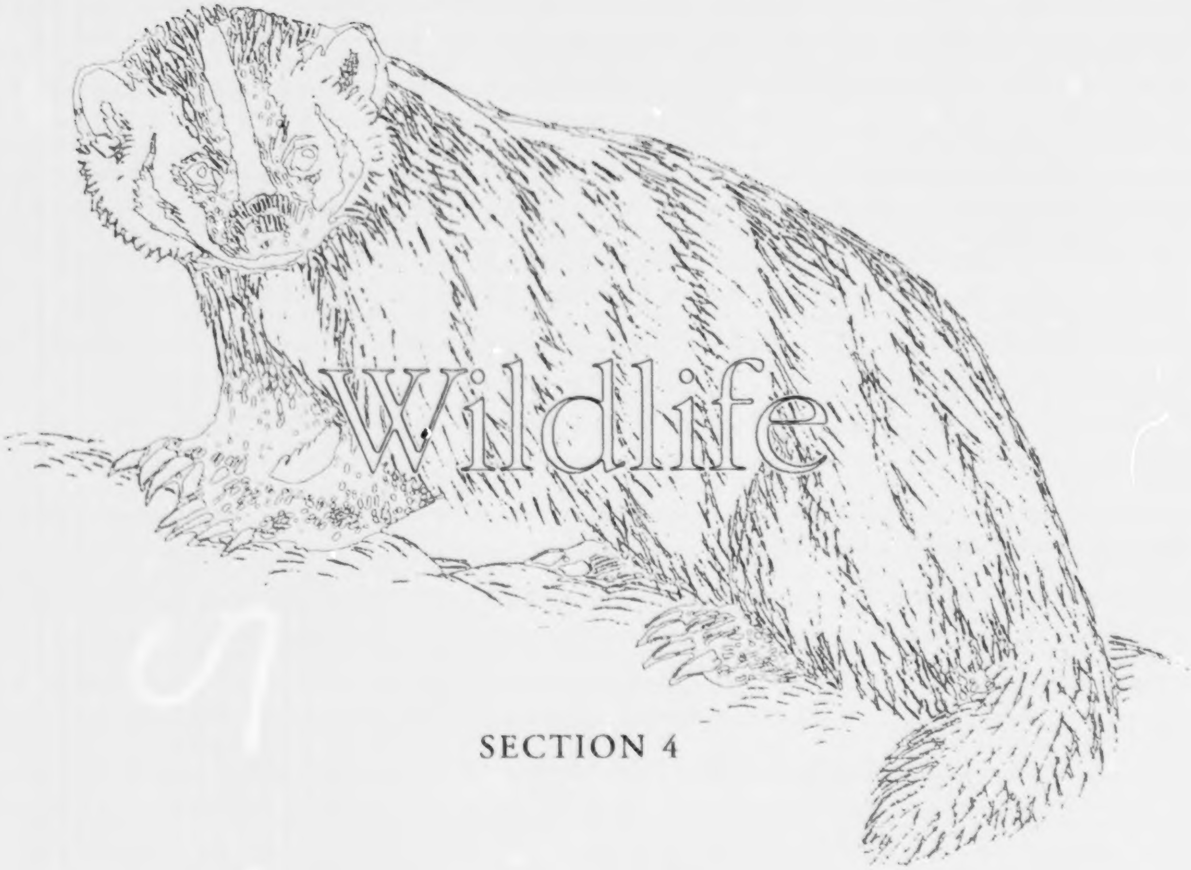
3. Find a:
    a) white flower
    b) red flower
    c) yellow flower

4. Find a flower that:
    a) smells sweet
    b) has no smell

5. Find a flower that:
    a) lies on the ground
    b) grows on a tree

6. Find a flower where the pistils and the stamens are:
    a) easy to see/feel
    b) hard to find

7. Find a flower with:
    a) one insect on it. Can you see pollen on the insect?
    b) with more than one insect on it. What are they doing?



Wildlife

SECTION 4

ACTIVITY
21

Acting Like Animals

Summary:
Participants learn animal characteristics by playing charades.

Grade Level:
2-6

Time:
45 minutes

Learning Objectives:
Participants will be able to:
- Describe different animal characteristics using alternative methods of communication.
- Begin to develop an understanding of animal classification.
- Identify different animals from student performances of them.

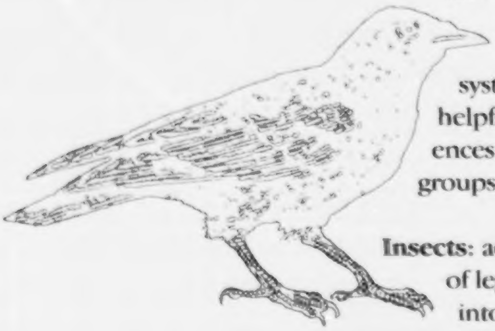
Materials Needed:
- Flipchart or blackboard
- Animal Cards provided at end of activity, -OR- index cards with a name of a different animal on each
- A bag or hat to put the slips in
- Pictures of animals to prepare the actor (optional)

Background:

Animals include all living things that are able to voluntarily move and that ultimately depend on plants for food. Even carnivores, which eat mostly meat of other animals, depend on the food energy of plants since the animals they eat depend on plants for food (or the animals they eat depend on animals that eat plants). Plants, on the other hand, are generally fixed in place and produce their own food and oxygen in the process of photosynthesis.

In biology, all life is divided into categories. Similar life forms are grouped into the same classification group. One characteristic, such as the existence of a backbone, often divides large groups of organisms (in this case, **vertebrates** are animals with backbones and **invertebrates** are those without).

In this activity, participants will learn and attempt to act out various characteristics of different animals. It is not necessary for them to understand the entire classification system, but it can be helpful to know the differences between animal groups, as follows:



Insects: adults have three pairs of legs, bodies segmented into three parts (head, **thorax**, and **abdomen**), and usually two pairs of wings.

Spiders: have a body divided into two parts: a **cephalothorax** with eight legs, two fangs, and two feelers, and an unsegmented abdomen with **spinnerets** that spin silk.

Reptiles: do not produce their own body heat so are **ectothermic**, have a backbone (so are vertebrates), usually lay eggs, are covered by scales or horny plates, and use lungs to breathe.

Amphibians: are ectothermic vertebrates with smooth skin, generally hatch from an egg as water-dwelling larvae with **gills**, and eventually transform into adults with air-breathing lungs.

Birds: produce their own body heat so are **endothermic**, lay eggs, are vertebrates, and have bodies covered with feathers and forelimbs that serve as wings.

Mammals: are endothermic vertebrates, females have **mammary glands** (which secrete milk to feed their young after birth), most mammals have hair on at least portions of body, and all except platypus (which lay eggs) give birth to live young.

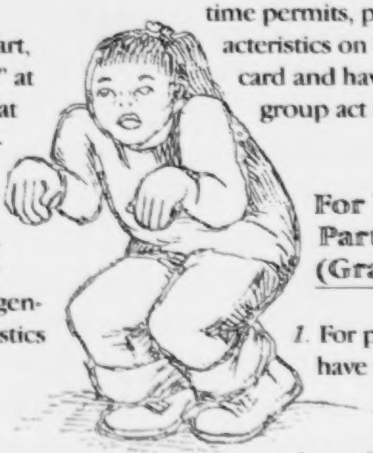
Acting Like Animals

ACTIVITY 21

What to Do:

1. Show participants several photos of different kinds of animals. Ask them what kinds of animals are represented (i.e., insects, spiders, reptiles, amphibians, birds, mammals, etc.). ***What characteristics do they see that help them tell the animal groups apart?***

2. On a board or flipchart, write the word "animal" at the top and then write at least three different categories (i.e., insects, reptiles, and mammals) of animals below. Ask them to define the word "animal." Then, generate a list of characteristics for each category.



3. Tell the group that they are going to play a game like charades, with animals as the topic.

4. Have participants help cut out the Animal Cards prior to the lesson. If more cards are needed, ask participants to help create them on a series of index cards. Make sure they include the name of each animal. Use pictures if available, or encourage participants to draw animals on the cards. Shuffle the cards and then hand out one card to each participant.

Each participant will act out his or her animal, while the rest of the group guesses what it is. The actor can act out either the name of the animal or how it looks or acts.

5. After the answer has been revealed, ask them what they know about the animal. Have a participant read the characteristics listed on the back of the Animal Card. If time permits, pick one of the characteristics on the back of the card and have a member of the group act it out.

For Younger Participants (Grades K-2):

1. For participants who have difficulty reading, use pictures or drawings to talk about the differences between animal groups (in Step 2, above).

2. For participants who do not know the characteristics of the animal they chose, take them aside and help them think of a few characteristics to act out. Some characteristics are on the back of the Animal cards.

3. If the group has a hard time guessing the answers, give them a selection of five different animals (one of which is the correct answer) from which to choose.

For Older Participants (Grades 7 and Up):

1. Have participants go through the first two steps, above. Older participants will likely be able to go into more depth regarding differences among organisms.

2. Tell participants that they will have a chance to get into groups to put on a small silent play involving an animal of their choice interacting with other animals and with its habitat. Have participants get into small groups and research a particular animal. It is important they do the research in secrecy.

3. Group members will decide on a "performance" and act it out for the rest of the group. The audience will then try to guess what animal they are portraying.

4. When they are finished, have each group discuss interesting characteristics of their animal.

Questions:

- What are some characteristics that set different animals apart?
- What are some of the groups animals are divided into?
- What are some interesting characteristics about animals portrayed here?

ACTIVITY
21

Acting Like Animals

Adaptations:

Refer to general adaptations on pages 11-16.

Hearing Disabilities:

- Provide hints or assistance to the participants as needed (some may have difficulty with the abstract nature of this activity).
- Have all participants raise their hands before making a guess. Instruct the individual who is guessing to face any participants who have a hearing disability as they make their guess. Have the sign language interpreter assist as needed.

Learning/Cognitive Disabilities:

- Use pictures and examples to illustrate the animals and the different behaviors. If possible, have an animal sound effects tape available to use in the introduction of the activity.
- Provide hints or assistance to the participants as needed (some may have difficulty with the abstract nature of this activity).
- Have the participants practice acting out an animal before the game starts. For example, you might have participants act like a bear by scratching their backs up against a tree, using their claws to capture and eat a fish, or curling up on the floor to hibernate.
- Have a variety of resource materials available, including audio cassettes and field guides with large color pictures (older participant version).
- If appropriate, complete the younger participant version of this activity.

Motor Disabilities:

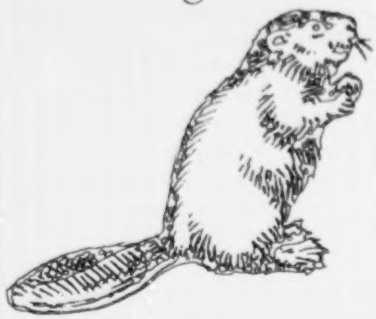
- Have participants use sounds if they have difficulty acting out the motions of the animal.
- An alternative is to have participants describe the animal (without using obvious words) by using as many details as possible (e.g., "I have feathers and sing in the forest," or "I have fur and eat berries.") if they have difficulty physically acting out the animal.

Visual Disabilities:

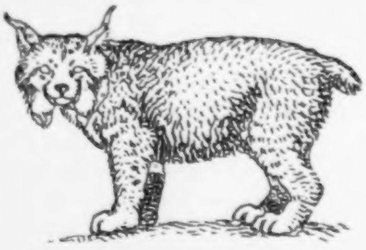
- If possible, have an animal sound effects tape available to use in the introduction of the activity.
- Enlarge cards for participants with low vision; label the cards in Braille. If this is not possible, you can have the participants pick a card and then whisper the animal name in their ear.
- Have a group narrator explain the actions of the other participants as they happen.
- Have all participants raise their hands to make a guess so that everyone has an opportunity to win.
- If participants are not comfortable acting out the actions, have them describe the animal (without using obvious words) by using as many details as possible (e.g., "I have feathers and sing in the forest," or "I have fur and eat berries.").
- When appropriate, have participants use sounds if they do not know the actions of an animal.
- Have resource materials available in alternate formats including large print, Braille, and audio cassette (older participant version).

Acting Like Animals Cards

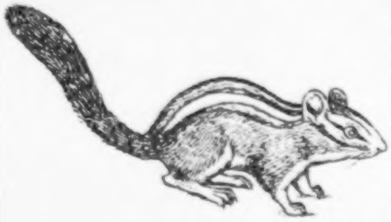
WORKSHEET



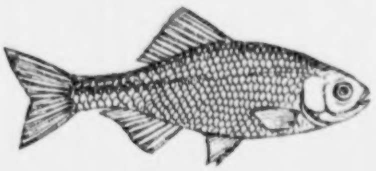
BEAVER



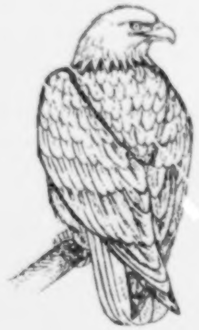
BOBCAT



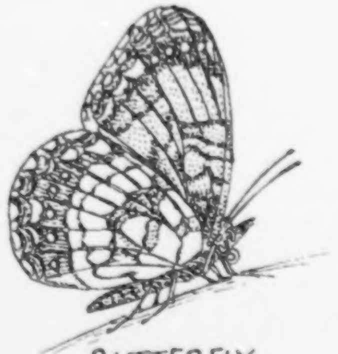
CHIPMUNK



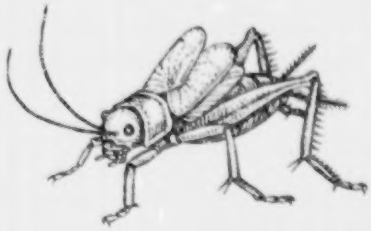
FISH



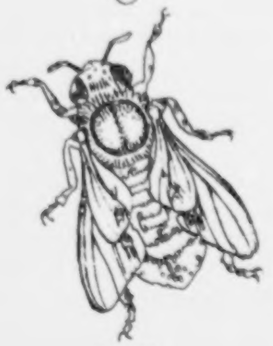
EAGLE



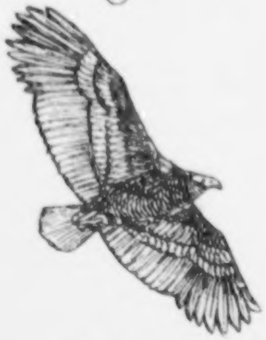
BUTTERFLY



CRICKET



BEE



VULTURE

WORKSHEET

Acting Like Animals Cards

Chipmunk:
- Digs long, shallow burrows to make its home.
- Nervous; scampers around on the ground or low branches of trees.
- Carries nuts, seeds, and fruit in expandable cheek pouches.

Bobcat:
- Small wild cat with tufted ears.
- Shy; hunts at night by sneaking up on prey and pouncing.
- Prefers the ground but can climb trees.

Beaver:
- Has four large front teeth (incisors).
- Gnaws on trees to eat soft inner bark and to build dams.
- Slaps the water with its tail when alarmed.

Butterfly:
- Antennae help it smell and feel, flies by flapping wings rapidly.
- Usually holds wings up when resting (some hold them flat).
- Has long proboscis (like a tongue) to suck up nectar.

Eagle:
- Soars through the air by holding its wings stretched straight out.
- Hunts for fish by gliding in with talons outstretched.
- When perching, stands with head upright, watching movements with quick turns of head.

Fish:
- Swallows food by gulping.
- Swims by moving body from side to side, controls direction with fins.
- Ectothermic (depends on outside temperatures for body heat).

Vulture:
- Soars with wings held in a slight V-shape above its body.
- Often perches with head hanging down.
- Projects vomit to protect themselves and young.

Bee:
- Flies rapidly from flower to flower.
- Collects nectar with proboscis.
- Collects pollen with hairy body.

Cricket:
- Males chirp by rubbing wings rapidly.
- Travels by hopping.
- Hangs on to grasses with bristles on hind legs.

An Unnatural Trail

ACTIVITY
22

Background:

Plant or animal species subjected to a major change in their environment over a long period (years of flooding, the appearance of a new predator, etc.) will do one of three things: leave, change, or die. If a species changes in any way over time to better fit into its environment, it has **adapted** to it. (We're talking about changes that are passed on from generation to generation in the species' population, not changes that one animal may make during its own lifetime.)

One primary illustration of an adaptation is **camouflage**. For example, a toad can sit still on a pile of leaves and remain unnoticed by a predator, because its colors match the forest. That species of toad has adapted to its surroundings with camouflage; a bright pink toad would not fare so well on the same forest floor. Camouflage describes any color, shape, or behavior that helps an animal hide from predators or prey.

What to Do:

1. Set up an Unnatural Trail before the group arrives by placing 15-20 objects along a stretch of trail or row of trees or bushes. Some items should blend in; others should be noticeable. The length of the trail depends on the size of the group; the larger the group, the longer the trail should be. (Example: with 10 participants, 10 yards might suffice, while with a group of 25, participants would likely run into each other at anything less than 20 yards.)

2. Explain to the participants that they are about to go on a special trail, called the Unnatural Trail. Tell them they will be able to walk the length of the trail at their own pace (without actually stopping or leaving the trail) to look carefully for several objects that do not belong next to a trail. Ask participants to find as many objects as they can.

3. Take participants to the edge of the trail. Allow participants to walk the length of the trail at their own pace (three to four minutes is a decent amount of time, but the time will depend on the group's needs) and to locate and keep count of as many objects as they can. They should look only once, keeping their findings a secret.

4. Once everyone has had a chance to navigate the trail, have them regroup and report how many items

Summary:

Participants explore the concept of camouflage by searching for hidden objects.

Grade Level:

4-6

Time:

45 minutes

Learning Objectives:

Participants will be able to:

◇ Define the concept of camouflage.

◇ Identify some ways that animals camouflage themselves.

◇ Demonstrate understanding of how wildlife adapts to its habitat as a means of survival.

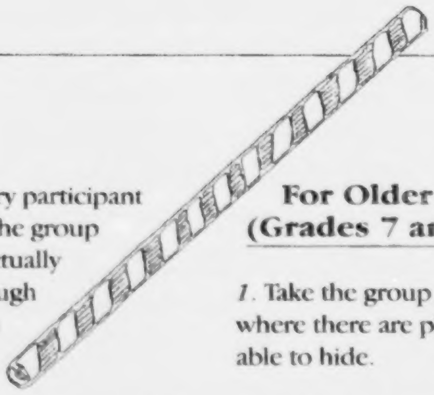
Materials Needed:

◇ 15-20 objects of various size and color, some that will blend into and some that will stand out from the environment. Here is a sample list:
- 1 pink ribbon (or one brightly colored ribbon)
- 2 soda cans: 1 green, 1 red
- 4 small pieces of construction paper: 1 green, 1 brown, 1 pink, 1 blue
- 1 green bandana
- 1 drinking straw
- 4 crayons or pencils: 1 red, 1 yellow, 1 green, 1 brown
- 1 piece of string
- 2 pens: 1 black, 1 blue
- 2 film canisters: 1 black, 1 transparent

◇ Pictures of animals camouflaged with their environment

ACTIVITY
22

An Unnatural Trail



they saw. After every participant has reported, tell the group how many were actually there, and go through the trail as a group to pick up the objects one by one. Ask , *Why did some stand out while others were much harder to find? Did anyone see all of them?*

5. After finishing with the trail, explain that the objects that were hard to find were camouflaged, which for animals is an important adaptation to their habitat. Ask, *Can you think of any animals that use camouflage? How does it help them hide? Why is camouflage necessary for the survival of some animals?*

For Younger Participants (Grades K-3):

Take the group for a short walk in a park or an area with some wildlife (even if all you see are squirrels and crows!). Ask the participants which animals they spotted first. *How did they notice them?* Ask, *How do some animals blend in to their surroundings better than others? Can they think of any other animals that use camouflage to protect themselves? What did some of the animals do to get away from the participants?*

For Older Participants (Grades 7 and Up):

1. Take the group to a natural area where there are places they will be able to hide.

2. Tell the group that they will be able to see how good they are at camouflaging themselves and hiding from a "predator. " Ask the group what it means for an animal to use camouflage to escape from a predator.

3. Mark off a 20-foot by 20-foot area of woods or other natural area (or simply tell the group what the boundaries are). For larger groups, make the area longer (but not deeper).

4. Ask for one volunteer to be the predator. While the predator closes his or her eyes, the rest of the participants should do their best to hide in a minute or less. They may cover themselves in leaves or duck behind trees and/or logs, but they must stay within the marked area and be careful of live plants and animals. The predator, on the other hand, can only stand just outside of the marked area and try to spot the others by staying in one place. They should point to people or call out their names when they spot them. When the predator finds most of the group, have them all come out. Have the group decide on a new predator, and try it again. Try the hiding activity for 3 or 4 rounds.

5. Wrap up by asking, *Who was easy to find? Why? Who was difficult to find? Why? What were some things that helped the predator find different people? What are ways animals escape their predators? How are camouflage and standing still useful? When are certain colors less useful? What are other adaptations animals have taken on that help them escape their predators?*

Questions:

- What colors blend in well in the woods (or other natural area)?
- How do the colors of different animals help them survive?
- What are some other ways animals have adapted to survive in their environment?

Adaptations:

Refer to general adaptations on pages 11-16.

Hearing Disabilities:

- Use pictures and examples to illustrate the difference between natural and unnatural. Have pictures of a variety of wildlife that use camouflage (e.g., polar bear, praying mantis, chameleon).
- Position yourself and the interpreter so the participants can see you for further directions or warnings while on the trail.

An Unnatural Trail

ACTIVITY 22

- Clearly mark the trail with a beginning and an end point (use string or flags).

Learning/Cognitive Disabilities:

- Use pictures and examples to illustrate the difference between natural and unnatural. Have pictures of a variety of wildlife that use camouflage (e.g., polar bear, praying mantis, chameleon).
- Have participants identify a few examples of things that they should not find on a nature trail.
- Clearly mark the trail with a beginning and an end point (use string or flags).
- Have participants write down names of items or make tally marks if they have memory-related issues.

Motor Disabilities:

- Select a site that is largely accessible, such as along an existing paved trail or sidewalk if possible.
- Place some items close to the edge of the trail.

Visual Disabilities:

Overall:

- Have an example of tactile camouflage to help illustrate your point (e.g., a leaf mixed in with same-sized pieces of paper).
- Clearly mark the trail with a guide string on one side.
- Mark the trail into sections. If desired, tell each participant how many items he/she should find in each section.
- Have partners actively engage the participants in this activity, giving orientation directions and providing hints as needed. Encourage partners not to find items for the participants.

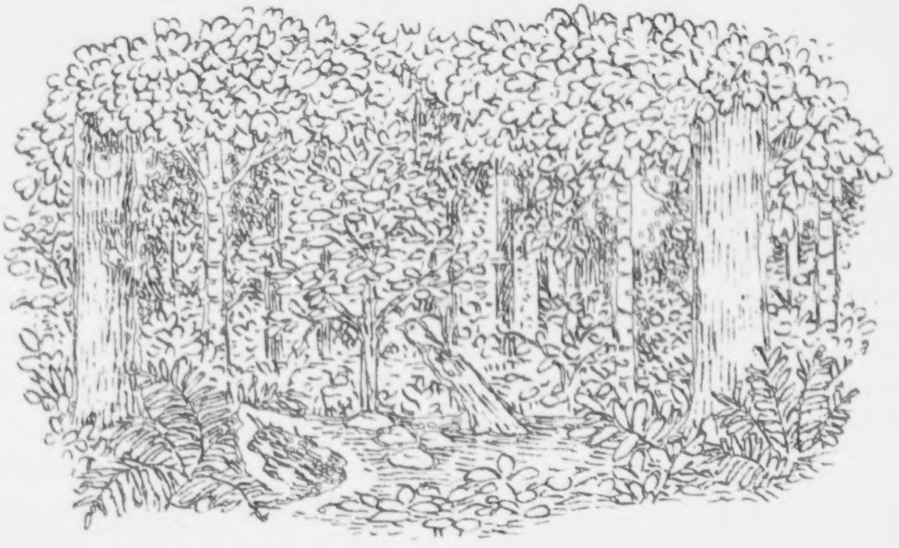
For participants with low vision:

- Use brightly colored and large objects on the trail.
- Use sound-and/or light-producing objects for some of the items (e.g., a radio, lantern, or metronome).

For participants who are blind:

- Use sound-producing objects for some of the items (e.g., a radio, metronome, or wind chimes).
- If you wish, set up a tabletop trail using natural and unnatural items that individuals can explore to decide if they belong or not. (Examples: put a feather in a bowl of pebbles, a piece of torn paper or a candy wrapper in with some leaves, a pipe cleaner in with some twigs, a soda can in a bowl of sand, etc.)
- Another alternative is to do an auditory trail. Use a tape of nature sounds along with a traditional sound effects tape and other sound producing objects (e.g., radio or metronome) to create the "trail." Have participants identify which sounds do not belong on a nature trail.

© 1998 Cornell, Joseph. This activity was adapted with permission from Sharing Nature with Children: 20th Anniversary Edition, *(1998), pages 42-45. For more information, see the Sharing Nature Foundation's website at www.sharingnature.com.*



ACTIVITY
23

Animal Homes Hike

Summary:

Participants will explore different animal homes and how they are built.

Grade Level:

3-6

Time:

30 - 45 minutes

Learning Objectives:

Participants will be able to:

◇ Identify and compare several kinds of animal homes.
◇ Identify some of the materials animals use to construct their homes.
◇ Describe how an animal's home building affects its environment.

Materials Needed:

◇ Pictures and/or samples of animal homes
◇ Copies of the Animal Homes Hike worksheets (optional)
◇ Clipboards and paper
◇ Pencils

Background:

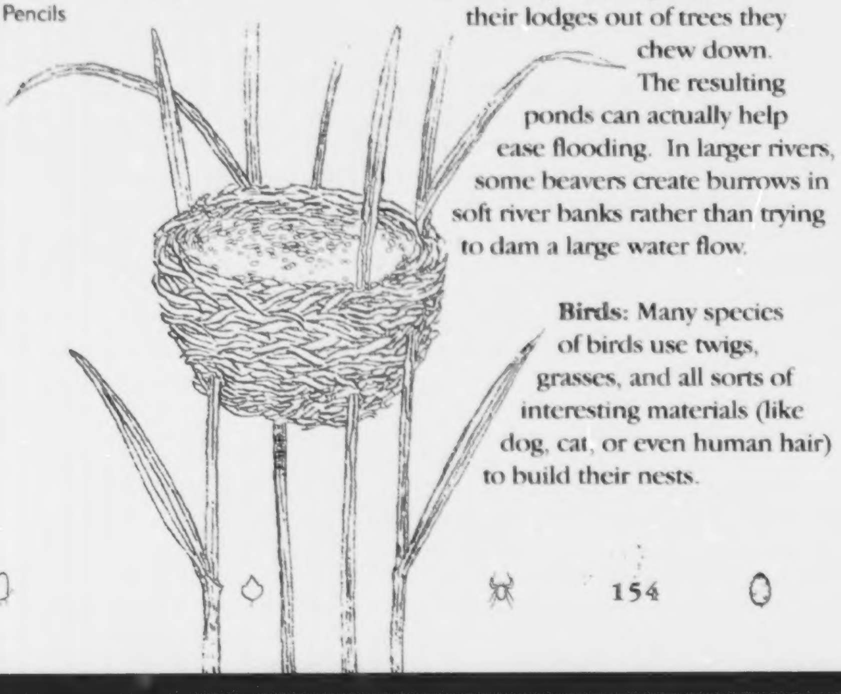
A variety of factors affect the ability of wildlife to survive. An animal's habitat must provide it with food, water, cover from the elements and predators, and a safe place to raise their young.

A tremendous number of animals, from ants and beavers to wolverines and yellow jackets, alter their surroundings to build their own homes. Here are some examples:

Ants: Most ants build some kind of tunnel system for their colony, whether it is the fungus-growing leaf-cutter ants in the southern U.S., the wood-burrowing carpenter ants throughout most of North America, or fire ants in Texas that build large mounds in the soil.

Beaver: Beavers affect their environment by building dams and their lodges out of trees they chew down. The resulting ponds can actually help ease flooding. In larger rivers, some beavers create burrows in soft river banks rather than trying to dam a large water flow.

Birds: Many species of birds use twigs, grasses, and all sorts of interesting materials (like dog, cat, or even human hair) to build their nests.



Honeybees: These bees create elaborate comb structures made up of six-sided cells. The cell walls, which house different stages of both immature worker and female bees (as well as a cell for the queen bee), are made of material secreted and chewed by worker bees called beeswax.

Squirrels: While out looking for bird homes, it is not uncommon to look up in the higher branches of a tree and spot a large, messy collection of leaves and sticks. These tree squirrel nests are larger and much more disorganized than most bird nests.

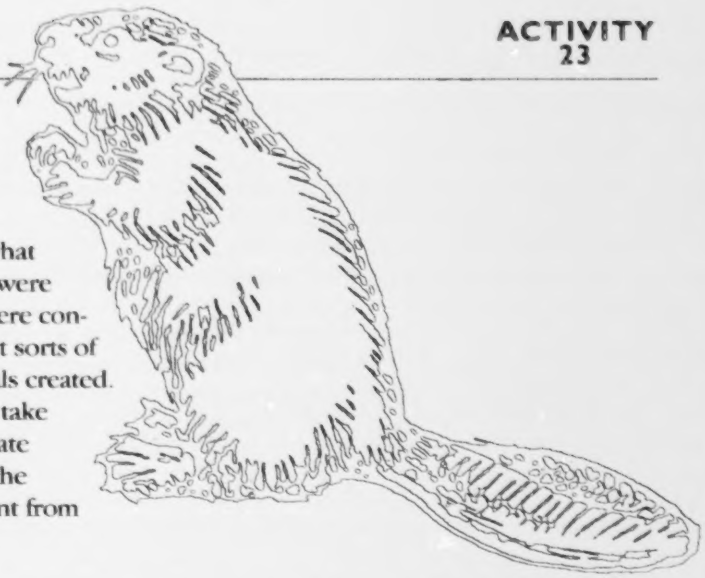
Wolverines: A member of the weasel family, these ferocious animals build underground dens lined with leaves. They will aggressively protect their young within the den. They inhabit the far northern reaches of the United States, including Alaska, and many parts of Canada.

Yellow jackets: These wasps build nest systems in holes underground, and will attack without warning if the nest area is disturbed.

***Note:** "Disturbing" the nest area includes stepping on or near the exit hole, so any observation of yellow jackets entering and exiting a hole should take place a good 25 feet away).*

Animal Homes Hike

ACTIVITY
23



What to Do:

1. Ask, *Where do animals live? What kinds of homes do they live in? How do they make these homes?* Discuss why and how animals alter their environments to meet their basic needs. Show different pictures of animal homes and any actual examples that are available (e.g., bird nests or beehives).

2. Introduce the activity as a hike to find some animal homes (e.g., bird nests, insect galls, cocoons, webs, hives, holes in the ground, tunnels). Ask participants to list off and discuss the different animals that alter their environment to build their homes.

3. Before they begin looking, explain to the group that as visitors to this animal home neighborhood, they must make sure to be gentle with anything they investigate. Keep participants in a relatively small area and help them with their discoveries.

***Note:** Be sure to review appropriate safety considerations on pages 17-18.*

4. If appropriate for your group, hand out the Animal Homes worksheet to help the group identify and locate those homes. As participants find the different homes on the sheet (and any others they may find), ask them to investigate how the homes were built. Ask them what sorts of materials were used, how they were constructed, and what sorts of designs the animals created. Have participants take notes as appropriate and discuss how the homes are different from one another.

5. With careful observation, participants may find birds' nests, woodpecker holes, beetle tunnels, wasp and hornet nests, insect galls, etc. To find bird nests, participants should look high and low, in shrubs, grasses, and in trees. Building ledges, eaves of houses, telephone poles, and other man-made structures also provide places for nests. Other homes they may see are big, leafy squirrel nests, and grass-covered rabbit and mole burrows. Be sure to investigate rotting logs too, but do so carefully, and if they are moved, gently return them to the position in which they were found.

6. When you return from your hike, discuss and compare what participants found. Have them draw their favorite, or the most interesting animal home they found on the back of their worksheet or on a sheet of paper. Wrap up by asking how each animal affects its environment when it builds its home; for instance, *How does a beetle actually help its area by boring into a tree? How does a beaver's dam-building affect its environment?*

For Younger Participants (Grades K-2):

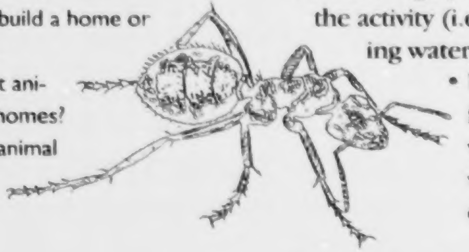
Follow the above instructions, but be sure to stick to five or fewer concrete examples of animal homes (i.e., the pictures of a bird's nest, a rock pile, a beehive, a pond, and an anthill provided on the worksheet). If possible, show examples of animal homes before going to look for them.

For Older Participants (Grades 7 and Up):

After going through the steps above, ask participants to "deconstruct" the building in which they meet. Ask them to make a list of as many materials as they can determine the building was made of. Have them determine how each piece came to be made, and where it came from. Ask them how humans are different than the animals that constructed homes outside, and how they are alike.

Questions:

- What animals alter their surroundings to build a home or other structure?
- How do different animals build their homes?
- How does each animal affect its environment?



Adaptations:

Refer to general adaptations on pages 11-16.

Hearing Disabilities:

- Use as many pictures/examples of animal homes as possible.
- Have a set meeting place on the trail in case anyone gets separated.
- Position yourself and the sign language interpreter so the participants can see you for further directions or warnings while on the trail.

Learning/Cognitive Disabilities:

- Use as many pictures/examples of animal homes as possible.
- Have a set meeting place on the trail in case anyone gets separated.
- Use the worksheet for participants who have difficulty writing or with memory-related issues. Provide clipboards.
- Have partners point out animal homes as needed.

Motor Disabilities:

- Select a largely accessible site for the activity (i.e., level, no standing water, etc.).
- Use the worksheet for participants who have difficulty writing. Provide clipboards.

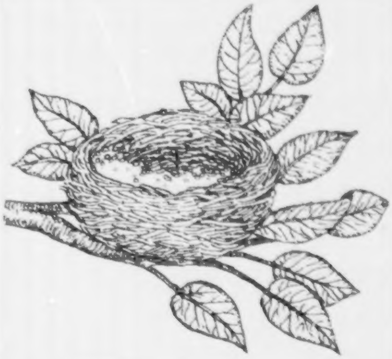
Visual Disabilities:

- Have samples of animal homes (e.g., birds nests, cocoons) and materials animals use to construct homes for participants to feel and explore.
- Clearly mark the trail with a guide string on one side.
- Encourage partners to actively engage participants in the activity by vividly describing the different homes and surrounding area in detail. Have partners encourage participants to touch appropriate items and explore nature with all their senses.
- If using the worksheets, create a large print version. Enlarge the pictures and spread across several pages.
- If desired, set up a trail of your own for participants that includes different animal homes (e.g., bird nest, rock pile). Label the homes with large print/Braille to encourage self-identification and exploration.

Animal Homes Hike

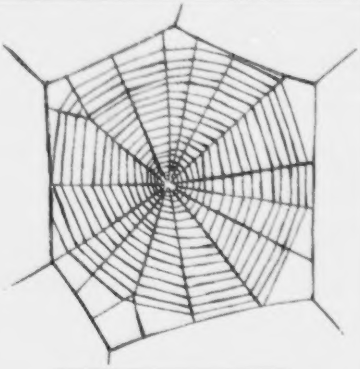
WORKSHEET

DIRECTIONS: Place a tally mark below the animal home each time you observe it on your hike.



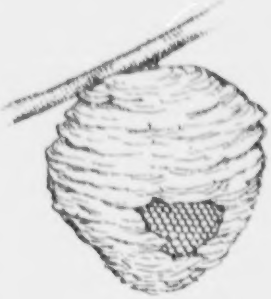
____

Nest



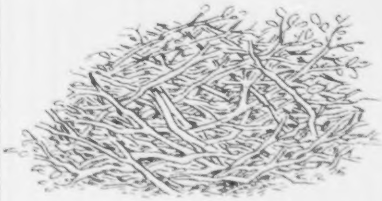
____

Web



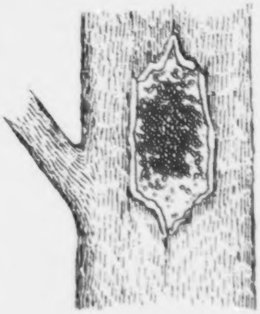
____

Hive



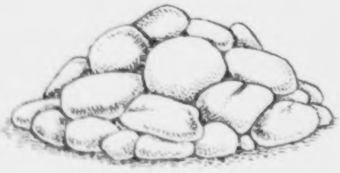
____

Brush Pile



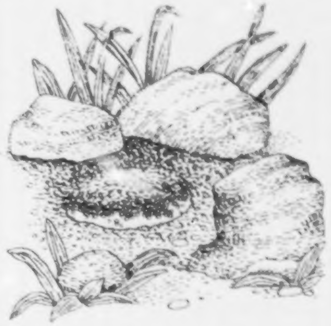
____

Tree Hollow



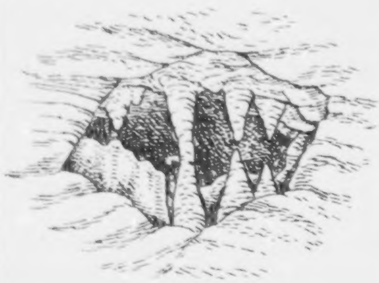
____

Rock Pile



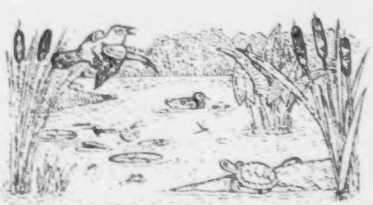
____

Mound, or Hole in Ground



____

Crevice, or Cave



____

Pond, Stream, or Lake

Animal Homes Hike

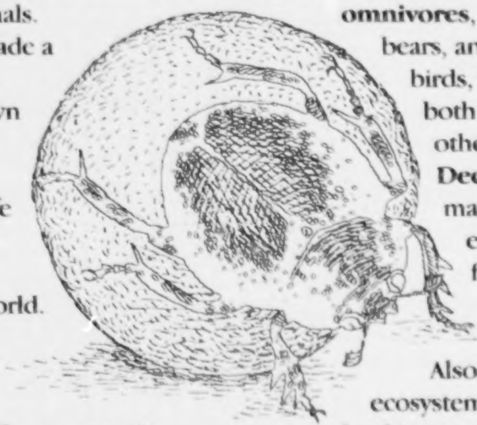
DIRECTIONS: Draw/list any animal homes you find on your hike.

Local Wildlife

ACTIVITY 24

Background:

Learning about how local wildlife fits into their ecosystem will help bring relevancy to other inquiries about the natural world. Participants who have watched butterflies at a garden in their city, fish in a local river, or deer in their backyard can best relate to a lesson involving these animals. Once they have made a connection to the wildlife in their own community, it is a smaller jump to learn about wildlife issues around the country and throughout the world.



Each animal has a particular **habitat** in which it lives. The greater picture, called an **ecosystem**, is a system of complex interrelationships between living and non-living elements. An animal fits into its ecosystem in different ways. For example, grizzly bears need very different types and amounts of food, water, cover, and places to raise young than, say, hummingbirds.

The way an animal (or other organism) fits into its ecosystem is called its **niche**. More specifically, an animal's niche often describes what it eats and what eats it. A line of organisms placed in order of what is eaten by what is called a **food chain** (see sample food chain below).

Not included in this example are **omnivores**, like humans, bears, and many songbirds, which eat both plants and other animals. **Decomposers** may include earthworms, fungus, bacteria, and other organisms. Also, within the ecosystem represented by this sample food chain, other animals will eat, or be eaten by, the different organisms. So the frog may also eat earthworms, and a small snake might be eaten by a bird of prey. Many animals eat on several different levels of the chain; for example, a raccoon might eat blueberries, ants, or snake eggs. Several food chains operating

A sample food chain:

Wild Blue Lupine → Karner Blue Caterpillar → Frog → Snake → Fungus/Bacteria

The food chain above shows the following different levels:

Plant → Herbivore → Carnivore → Carnivore → Decomposer

Summary:

Participants discover how local wildlife fits into their area.

Grade Level:

5-12

Time:

1 or more 45-minute periods; extra time for research if necessary

Learning Objectives:

Participants will be able to:

- ◇ Identify different animal species.
- ◇ Define the terms: ecosystem, food chain, niche, and food web.
- ◇ Describe at least one animal's role in its ecosystem, and how roles are interconnected.
- ◇ Apply understanding of food webs and/or ecosystem to predict consequences of removal of organisms from the system.

Materials Needed:

- ◇ Poster or pictures of the local ecosystem, including wildlife
- ◇ Paste, old magazines and/or calendars (optional)
- ◇ Construction paper, butcher paper and/or poster board (optional)
- ◇ Markers (optional)
- ◇ Copies of the Food Web worksheets
- ◇ Pens and paper
- ◇ Research materials

simultaneously in a large, complex system such as this can be collectively referred to as a **food web**. See worksheet at the end of the activity for a sample food web.

What to Do:

1. Before beginning the activity, draw or paste pictures of different animals on separate pieces of construction paper. Create two or three copies of each picture, so that there are enough for participants to form groups of two or three by animal. So, for example, if there are 15 participants, find five animals and make three copies of each animal, or about seven animals and two copies of each animal. Label the pictures.

2. Introduce this activity by asking participants if they know what local wildlife lives in their area. Ask, ***What local animals are considered wildlife? What do they eat? What eats them?***

3. Hand out the pictures, telling each participant to place his or her picture face down so that no one else can discover the identity of the animal. Tell them that they must wander around among the group and guess each other's identities, but that they can ask and answer only "yes" or "no" questions. Sample questions include; "Are you a mammal?"; "Do you eat plants?"; and "Are you red?" If the rest of the group is really stumped, give a few hints. After a few minutes, participants will discover that some people have the same animal. Once they do this, have them form groups according to their animal identity.

4. In small groups, participants will investigate how their animal uses its ecosystem, and fill out the worksheet (p.165). They should find out where the animal lives, several things it eats, and what eats it. Encourage participants to discover interesting facts about the animal's habitat. Once they have finished their research, each group can begin creating a design of the food web to which the animal belongs. They can do this by pasting or drawing pictures of different organisms on a piece of poster board or butcher paper. Then, they should draw arrows to indicate what eats what. Make sure they include their animal in a prominent location. If they have other important facts they want to share about their animal, they can include those on their design as well.

5. Have each group present their food web to the whole group. Participants should talk about the animal, where it lives, what it eats, and generally how it fits into its ecosystem. When the groups are finished, ask the whole group what would happen if one of those animals disappeared. Ask what they think would happen to the plants or animals it eats, and what might happen to animals or other things (decomposers, for example) that might eat it. Discuss how animals might disappear (i.e., habitat loss, pesticides, etc.), and what people can do to help.

For more information on local species, contact an NWF field office or an affiliated organization at the state level. Look up information on these places on the web at http://www.nwf.org/nearyou/. If there is interest in endangered local wildlife, a good source of information can be found on the web at http://www.nwf.org/wildalive/. Another good source is the U.S. Fish and Wildlife Service's site of endangered species at http://endangered.fws.gov/wildlife.html.

SAMPLE FOOD CHAINS

Primary producer	White Oak
Primary consumer	Worm
Secondary consumer	Salamander
Tertiary consumer	Frog
Decomposer	Fungus/Bacteria
Primary producer	Flower
Primary consumer	Butterfly
Secondary consumer	Bluebird
Tertiary consumer	Snake
Decomposer	Fungus/Bacteria
Primary producer	Red maple
Primary consumer	Worm
Secondary consumer	Mole
Tertiary consumer	Coyote
Decomposer	Fungus/Bacteria
Primary producer	Blueberry
Primary consumer	Ant
Secondary consumer	Frog
Tertiary consumer	Fish
Decomposer	Fungus/Bacteria
Primary producer	Walnut
Primary consumer	Luna moth
Secondary consumer	Flying squirrel
Tertiary consumer	Owl
Decomposer	Fungus/Bacteria

For Younger Participants (Grades K-4):

It will be necessary to prepare some research on local plants and animals ahead of time. For the youngest participants (K-2), use labeled pictures of different plants and animals and a large poster or model of a food web. Use the sample food chain and sample food web sheets below if appropriate to the region. Have a break between the guessing game (Step 3, above) and the rest of the activity. Consider splitting them up as two separate activities.

Questions:

- What animals would be considered wildlife in your area?
- How do they fit into the local ecosystem?
- What happens to the rest of the ecosystem if one animal is removed?

Adaptations:

Refer to general adaptations on pages 11-16.

Hearing Disabilities:

- Create a poster-size version of a food web to help illustrate the concept. Use different plants, animals, etc. than your group is using.
- Have all participants write down comments and input to facilitate effective communication in their small groups.
- Allow participants who have difficulty speaking to utilize the sign language interpreter for the discussion and their presentations.

Learning/Cognitive Disabilities:

- Create a poster-size version of a food web to help illustrate concept. Use different animals, etc. than your group is using.
- Have a variety of reference materials available, including picture books and recorded materials for individuals who have difficulty reading.
- Have participants who have difficulty writing dictate their input to a group recorder, work on artwork, and/or give the oral presentation. Skip the worksheet portion of the activity as appropriate.
- Encourage partners to actively guide the participant through the "yes" and "no" question portion of the activity as needed.
- Have a lot of pictures available for participants to use on their posters. Consider having items such as fabric scraps, string, sticks, acorns, etc. for participants to create a 3-D poster. If desired, have all groups create the project in this alternative format.

Motor Disabilities:

For participants with limited muscle strength, coordination, or dexterity of the hands:

- Have adaptive scissors and large glue sticks available.
- Have participants who have difficulty writing dictate their input to a group recorder, work on artwork, and/or give the oral presentation.

Visual Disabilities:

Overall:

- Have reference materials available in alternative formats such as Braille, large print, and/or recorded materials.
- Create a tactile food web poster using different fabrics, yarn, and items such as acorns or leaves; label the poster in large print and Braille.

For participants with low vision:

- Have a large print version of the Food Web worksheet available. Provide thick black markers for use.
- Create large print animal cards for the first part of the activity.

For participants who are blind:

- Have a Braille version of the Food Web worksheet.
- Have participants use their own writing equipment, have a Braille writer available, or have them dictate information to a group recorder.
- Label the animal cards in Braille or whisper the name of the assigned animal to the participant for the first part of the activity.
- Encourage partners to actively guide the participant through the "yes" and "no" question portion of the activity as needed.
- Have items such as fabric scraps, string, sticks, acorns, etc. for participants to create a 3-D poster of the food web or allow participants to create a food web model out of clay. Provide a Braille labeler if possible. Have partners verbally guide participants through the assembly process. If desired, have all groups create the project in this alternative format.

Local Wildlife

WORKSHEET

DIRECTIONS: Instructors, research a food chain by completing the worksheet. (Older participants may be able to do this worksheet themselves.)

Primary Producer:
(plant)

Name
Habitat
Range
Uses (food source for animals)

Primary Consumer:
(herbivore)

Name
Habitat
Range
Food
Water
Shelter
Place to raise young
Predators
Threats
Natural
Man-made

Secondary Consumer:
(carnivore)

Name
Habitat
Range
Food
Water
Shelter
Place to raise young
Predators
Threats
Natural
Man-made

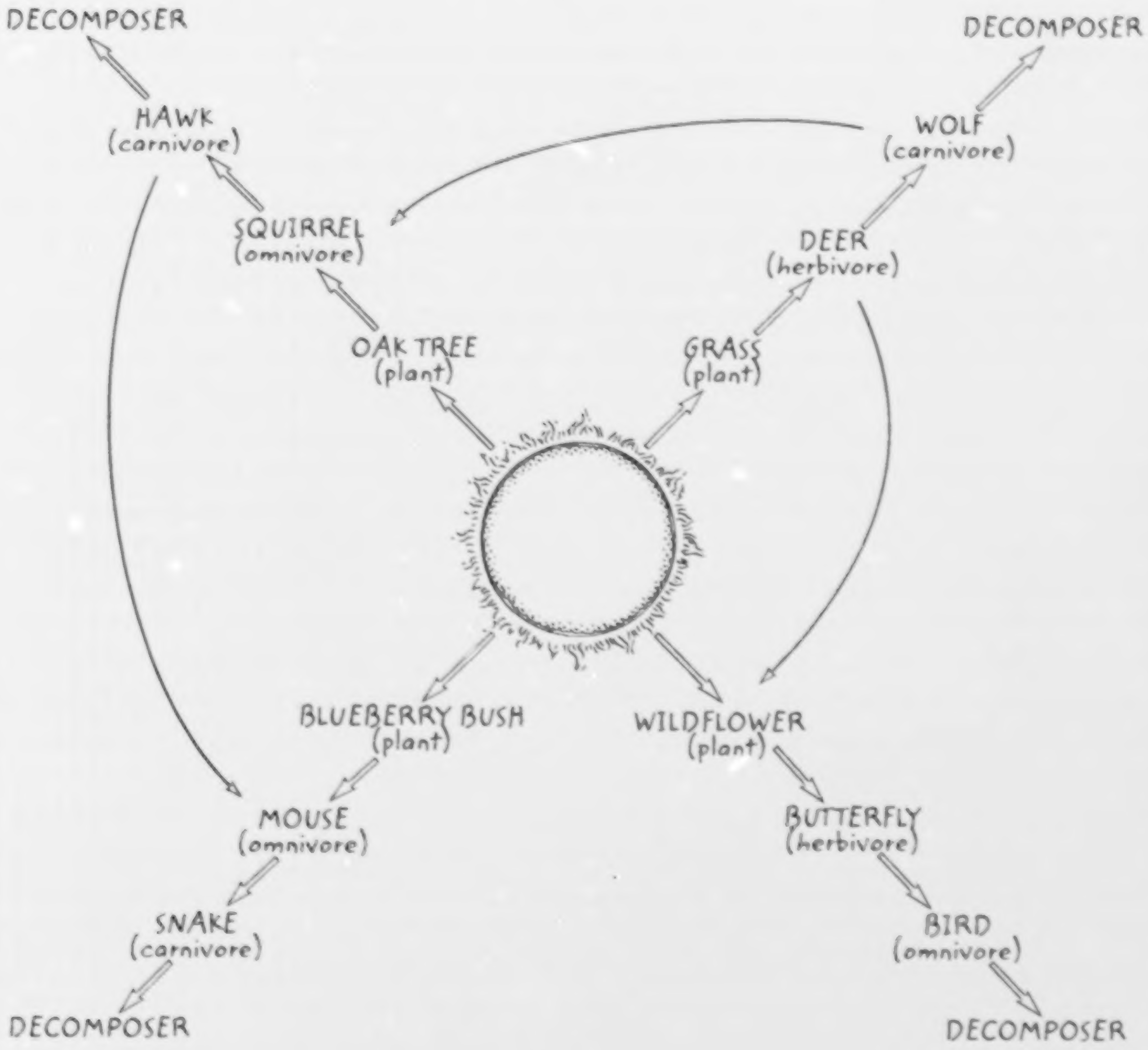
Tertiary Consumer:
(top predator)

Name
Habitat
Range
Food
Water
Shelter
Place to raise young
Predators
Threats
Natural
Man-made

Decomposer or Scavenger:

Name
Habitat
Range
Food
Water
Shelter
Place to raise young
Predators
Threats
Natural
Man-made

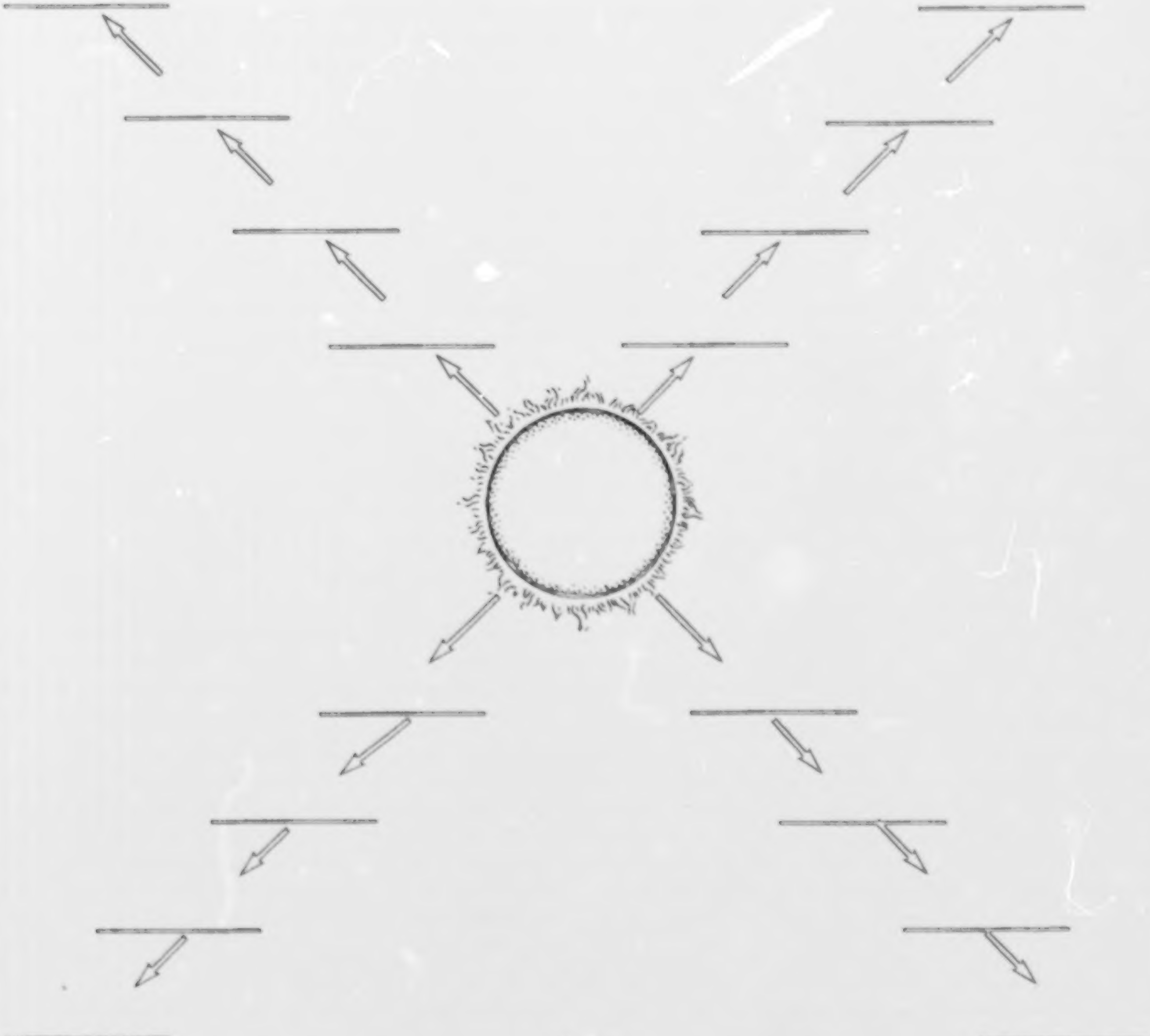
DIRECTIONS: Review this sample food web. (Other connections would be made in nature.)


DECOMPOSER
DECOMPOSER
HAWK
(carnivore)
WOLF
(carnivore)
SQUIRREL
(omnivore)
DEER
(herbivore)
OAK TREE
(plant)
GRASS
(plant)
BLUEBERRY BUSH
(plant)
WILDFLOWER
(plant)
MOUSE
(omnivore)
BUTTERFLY
(herbivore)
SNAKE
(carnivore)
BIRD
(omnivore)
DECOMPOSER
DECOMPOSER

Local Wildlife

WORKSHEET

DIRECTIONS: Place your animal in one of the food chains below. Based on your research, fill in appropriate plants and animals; label each level. Draw arrows connecting the chains to create a food web.



ACTIVITY
25

Habitat Hunt

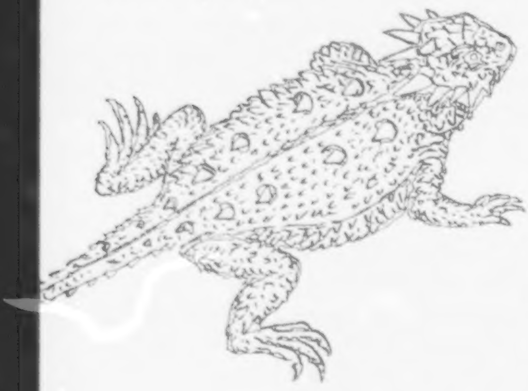
Summary:
Participants conduct a search for important habitat elements for several animals.

Grade Level:
3-6

Time:
1 hour or more, depending on time for research.

Learning Objectives:
Participants will be able to:
- Define the term habitat, and the basic needs it must meet in order for wildlife to survive there.
- Differentiate between kinds of wildlife habitats.
- Apply understanding of habitats to find a suitable one outside.

Materials Needed:
- Copies of the Habitat Hunt worksheet
- Field guides, encyclopedias, or a good dictionary
- Pens or pencils



Background:

In order for an animal to survive, it must be able to find an adequate habitat that provides **food**, **water**, **cover**, and a safe **place to raise young**. The amount and quality of these needs varies a great deal from species to species. For this activity, it is a good idea to have a general wildlife guide, an encyclopedia, dictionary, or some old magazines with pictures and information on each animal.

Here are a few examples, some of which may be common animals in most areas, and others that may be quite rare or specific to an area.

Fireflies: For food, fireflies eat soft-bodied insects, snails, slugs, and mites (only in the larval stage; many don't eat anything in the adult stage). Water is from the food they eat, rain puddles, dew, or damp soil. Adult fireflies find cover in thick grass, under leaves. They lay eggs in rotting wood or damp debris on the ground, and larvae spend the winter just under the soil (this could be considered a place to raise young).

Lynx: These tufted-eared cats prey on small mammals (especially the snowshoe hare) and birds. They need a clean water source like a pond, spring, or lake. Lynx often seek cover under ledges, roots of fallen trees, or low branches, and also may lay in wait for prey up on the branches of a tree. They raise young in hollow trees or in the nooks and crannies of boulders.

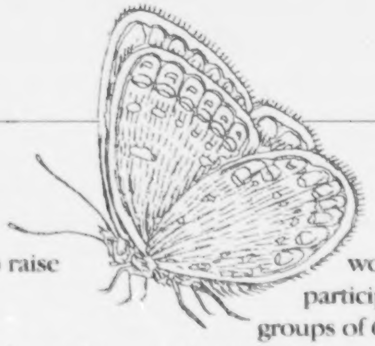
Cedar Waxwing: This sleek, brown, black-masked bird eats berries starting in late summer, and insects during the warmer months. They need a clean water source, such as puddles that return with regularity, ponds, etc. Cedar Waxwings prefer the edge of a forest, and so find cover in thick undergrowth or amongst trees that grow along the edge. They often make their nests on the branches of cedar or maple trees.

Horned Lizard: These spiny, flat lizards eat mostly insects, especially ants. For water, the horned lizard runs out into the rain and stands with its body spread wide to collect rain on the scales on its back. The rainwater moves along the narrow grooves between the scales, towards its head and into its mouth. It may find cover from the elements by digging into the sand, but it often relies on camouflage, laying flat and blending into the desert floor to escape predators. Most horned lizards bury their eggs underground.

Karner Blue Butterfly: As caterpillars, Karner Blues eat a plant called the wild blue lupine. As adults, they eat the nectar of various flowers such as butterfly weed and horsemint. Adults get water from the nectar they eat and other incidental

Habitat Hunt

ACTIVITY
25



sources like rain or dew. Karner Blues need some tree cover as protection from the sun, but they need open spaces as well, since that is where the plants they feed on live. They lay eggs in the wild blue lupine, a crucial element in their life cycle.

What to Do:

1. Ask participants to review the four basic elements of habitat and the importance of each for an animal's survival.

2. Give participants the Habitat Hunt worksheet to be completed outside. Assign or let them choose a particular regional animal, and review the following directions:

You are a ___________________, and in order to survive you need food, water, cover and places to raise your young.

Take a look around you. *Do you see all the necessary habitat elements for you to survive here?*

Spend some time exploring this area. Look for all the characteristics of habitat that meet your specific needs. Based on what you find, you will decide to stay and call this area "home" or continue to look for a new place to call home. Describe the four elements of habitat you found that meet your needs (food, water, cover, and place to raise young).

Will you stay and set up home for you and your family here? Why or why not? What other habitat elements would you like to see here?

3. It will be necessary for participants to identify the habitat needs of their individual animals prior to going outside to complete the worksheet. If time permits, set up a research station with field guides and other resource materials where they can investigate these needs. If desired, this could be done ahead of time as a research project. If time is short, provide basic information on individual animal needs to the participants.

4. Before sending participants outside, be sure to review appropriate safety considerations on page 17-18. Consider setting up "boundary lines" if participants have a large area to explore.

5. When participants return, wrap up by allowing them to share what they found on the hunt. Have the group identify which animals would be best suited to their habitat.

For Younger Participants (Grades K-2):

1 Introduce activity as in Step 1, above. Instead of handing out the worksheet, break participants into groups of 6-10, and have a volunteer oversee small groups. Give each group a minute or so to choose an animal that may or may not live in the area (if they can't decide, choose one for them). Each volunteer should have a field guide or other resource material appropriate to the animal chosen (they can use the examples given in the background if no other sources are available).

2. Tell groups that they will first look for the right kind of food for their animal. The volunteer with the group should allow participants to try to guess what the animals eat, but they should help out with one or two suggestions if necessary. After a few minutes of searching, they should look for water, then cover, and finally, places to raise young.

3. After the group has searched for these elements, they should vote as to whether or not their animal would live in their area.

For Older Participants (Grades 7 and Up):

Ask each participant to research a particular animal's needs, beginning with food, water, cover, and places to raise young. On the back of the worksheet, ask them to include other elements, such as weather, geographical location, the amount of room they need, the amount of sunlight, the type of terrain they prefer, and so on. Ask participants if their animal spends all its time in one area or if it moves around.

Questions:

- What sort of food, water, cover, and places to raise young do local animals require?
- Where in this area do these four elements of habitat exist?
- What elements are missing?

Adaptations:

Refer to general adaptations on pages 11-16.

Hearing Disabilities:

- Have pictures and/or hands-on examples of different habitat elements for participants to see and explore.
- Position yourself and the sign language interpreter so the participants can see you for further directions or warnings while out in the field.
- Have a set meeting place in case individuals get separated.
- Allow participants to use the sign language interpreter to report their findings to the group.

Learning/Cognitive Disabilities:

- Have pictures and/or hands-on examples of different habitat elements for participants to see and explore.
- Have a variety of reference materials available, including picture books and recorded materials for individuals who have difficulty reading.
- Provide a picture of their animal of choice or have a set of pictures/facts available and allow participants to pick one.
- Provide background on each participant's animal before they start out as needed.
- Pair up participants who have difficulty reading and/or writing to complete the research and worksheet. Have participants dictate information to partners, use tape recorders, or draw pictures to represent their findings. Encourage partners to actively engage participants in the activity, but not do the work for them.
- Mark off the area with flags or strings.
- Have a set meeting place in case individuals get separated.
- If appropriate, have participants complete the younger participant version of the activity.

Motor Disabilities:

- Choose a largely accessible site to complete the outdoor portion of the activity.

For participants with limited muscle strength, coordination, or dexterity of the hands:

- Have participants who have difficulty writing dictate their input to a partner or use a tape recorder to complete the worksheet.

Visual Disabilities:

Overall:

- Have samples of different habitat elements for participants to feel and explore.
- Use sound effects when possible (e.g., bird calls, nature sound tapes, etc.) to illustrate your points.
- Clearly mark the area with a guide string on one side.
- Encourage partners to lead participants in using all their senses to help identify habitat elements.
- Have research materials available in alternative formats including Braille, large print, and recorded materials.

For participants with low vision:

- Have a large print version of the Habitat Hunt worksheet available. Provide thick black markers for use.

For participants who are blind:

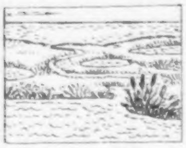
- Have a Braille version of the Habitat Hunt worksheet available.
- If they do not have a method of writing available to them, have tape recorders available for participants to record their information or have them dictate their answers to a partner.

Habitat Hunt

WORKSHEET

DIRECTIONS: You are a ____________________, and in order to survive you need food, water, cover, and places to raise your young. Take a look around you. Record the following information and decide whether or not you will stay and set up home here. Good luck and have fun!

Food Source: ____



Water Source: ____

Cover: ____

Places to Raise Young: ______________________________________

Questions:

1. Will you stay and set up home here? ______________________________

2. Why or why not? ____

3. What other habitat elements would you like to see here? ____________________

____

____

ACTIVITY
26

Woodland Chase

Summary:

Participants experience the predator/prey relationship with a fun outdoor activity.

Grade Level:

3-6

Time:

45 minutes

Learning Objectives:

Participants will be able to:

◇ Simulate the predator/prey relationship.
◇ Demonstrate an understanding of the roles of both predators and prey in maintaining healthy populations.
◇ Understand some of the ways predators and prey try to outwit each other.

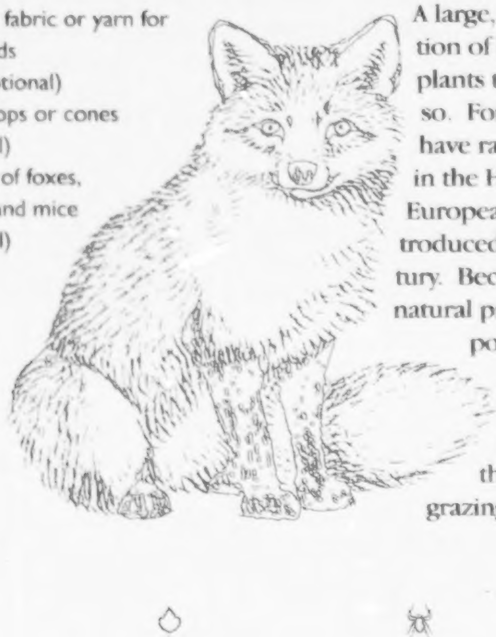
Materials Needed:

◇ Index cards
◇ Markers
◇ Colored fabric or yarn for arm bands
◇ Tape (optional)
◇ Hula hoops or cones (optional)
◇ Pictures of foxes, rabbits, and mice (optional)

Background:

The predator/prey relationship is, on some level, one of the simplest cycles in nature to comprehend. It is also an extremely important cycle in any ecosystem.

In short, animals that are **predators** hunt other animals, or **prey**, as an important (and often primary) food source. Generally, predators go after the easiest prey they can find, including the old, weak, ill, or very young. When many of these members are weeded out, a prey population remains stable and healthy. Any moderate reduction in a prey population helps keep numbers in check. If, for example, the rabbit population in an area is too large, the rabbits can decimate their food supply, and they either have to move on or die of starvation.



A large, unchecked population of **herbivores** can eat plants to extinction, or nearly so. For example, wild pigs have ravaged the countryside in the Hawaiian Islands since European wild boars were introduced in the late 18th century. Because the pigs have no natural predators to keep their population in check, and since many Hawaiian plants have no adaptations to protect themselves from overgrazing, the pigs have caused tremendous declines in many plant species. Some 25% of plants on the U.S. endangered species list are **endemic**, or unique, to the Hawaiian Islands, and the status of most of these plants is, at least in part, due to the destruction caused by these pigs.

In a healthy ecosystem, when prey is plentiful, predator populations increase. As predator numbers increase, prey numbers decrease. Following the decline in their food source, the predator population declines. With a decrease in the number of predators, the prey population can increase again, and the cycle continues.

Certain prey have developed effective defenses against their predators, such as chameleons with their camouflage, turtles and their armor, rabbits that freeze in place, and birds that flock together for safety. At the same time, predators have developed techniques to enhance their hunting practices. For example, bats find their prey by **echolocation**, which means essentially that they bounce sounds off their prey to locate them, like radar. Wolves hunt in packs to increase their hunting success, and foxes lie still in thickets or other cover to ambush their prey. It is an ongoing race to outwit each other!

In this game, participants will simulate the predator/prey relationship,

Woodland Chase

assuming the roles of foxes, rabbits, and mice. If desired, substitute a local predator and its prey from your region.

What to Do:

1. Ask participants to define the terms predator and prey. Have them cite example pairs such as wolf/elk, grizzly bear/salmon, or owl/mouse. Introduce the group to the predator/prey relationship. Explain the roles of both, and why they are both important. Briefly introduce hunting techniques and prey adaptations.

2. Next, tell participants that they are going to play a game where they get to be either a predator (fox) or a prey species (rabbit or mice). It can be played either indoors or outdoors, but should take place in a large, open area free of obstacles. To play the game, divide the participants using the guidelines below.

3. Give each player an identity card. See Figure 1 for game breakdown. This ratio may be varied in later rounds depending on outcomes. Tell players that some of the rabbit cards have a safety symbol on them (a red X). Foxes cannot capture a rabbit with a safety symbol on their card, so a rabbit in this situation will remain safe and alive, and the fox will have to find other prey. The safety symbol represents the fact that predators are not always successful in the hunt. When players receive their card, they should not reveal whether or not they have a safety symbol.

Figure 1:

Number of Players	Foxes	Rabbits (safety)	Mice
15-18	2	4 (1)	9-12
19-28	4	6 (2)	9-22
29-35	6	9 (3)	14-20
36-45	7	10 (3)	19-28
46-50	9	12 (4)	15-29

4. Give each group a different colored arm band, or tape pictures of their animals on their backs. Participants must remain in character throughout the game.

Foxes: Foxes hunt independently. Depending on the number of players, divide the game area into hunting territories and have each fox select a territory. During the course of the game, foxes must hunt only in their given territory. If a fox hunts outside of its territory, he or she must sacrifice all the prey cards and start again. To kill prey, foxes must tag the prey with both hands. Foxes must take 5-10 seconds to collect their prey's arm band or picture. In reality, it takes some time for a fox to consume its prey or to carry the kill to its den to feed its young. It is very unlikely that a fox will ever leave its kill unprotected to continue hunting.

Rabbits: Rabbits are herbivores, and should begin the game scattered about the playing area. If a fox tags a rabbit without a safety symbol, the rabbit is considered "dead;" he or she must give his or her card to the fox and must go sit on the sidelines. If tagged, rabbits with safety symbols must show the fox their card and then may resume play. Rabbits may move in between all hunting territories.

Mice: Most mice are considered omnivores, since they eat seeds, grains, and insects. They should begin the game scattered around the playing field. The same rules for rabbits apply for mice.

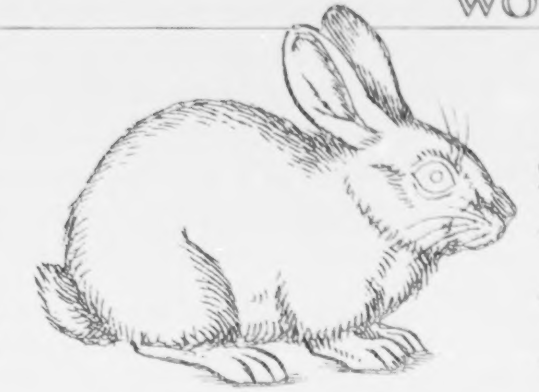
The leader will decide when to end each round of the activity. At the end of the round each fox counts their food points to see if they were able to successfully hunt enough food to survive. Mice are worth one point and rabbits are worth five points. See Figure 2 to determine fox survival needs.

Figure 2:

Number of Players	Survival Points
15-18	12-15
19-28	20-25
29-35	35-40
36-45	36-45
46-50	50-55

5. At the beginning of the next round, explain that in a healthy ecosystem, surviving prey animals often reproduce a significant number of young, and predators that found enough food will also reproduce, though usually they produce a smaller number of young than the prey animals. Therefore, the animals that survived the first round remain the same, the foxes that did not survive become mice, rabbits who were eaten become foxes, and mice who were eaten become rabbits.

It is important to note that the numbers of animals each round produces might not be exactly true to life, but participants should get the general idea of how the predator/prey relationship works. If possible, rotate predator/prey roles so that each participant gets to experience both sides of the relationship.



6. After the second round, modifications may be made. For example:

- Add a competing predator, such as a coyote or bobcat, who for the purposes of the activity hunts only rabbits.
- Add a poison symbol to some of the prey cards, which kills the fox or foxes that hunt that animal.
- Decrease the number of prey animals and increase the number of predators; cite drought or disease as a reason.
- Add safe zones (use hula-hoops or cones to mark-off areas), where prey animals can stand. Players can stay there for a count of ten, then they must move on. If a fox is waiting for they prey animals, it must step back ten paces from the safe zone.

7. Wrap up by asking some of these questions: *What aspects of the activity made it realistic?* (Safety symbols, use of territories, etc.) *What would make the game more realistic? How do competing predators affect the game?*

Questions:

- How do predators and prey depend on each other?
- What would happen if there were no predators in a place with many prey?
- How would competing predators affect the ecosystem?

Adaptations:

Refer to general adaptations on pages 11-16.

Hearing Disabilities:

- Use pictures/drawings to illustrate predator/prey examples and related information in the introduction to the activity.
- Demonstrate each step of the game as you explain it.
- Use a signal such as a flag to show when time is up.

Learning/Cognitive Disabilities:

- Use pictures/drawings to illustrate predator/prey examples and related information in the introduction to the activity.
- Demonstrate each step of the game as you explain it.
- Simplify the predator/prey roles as needed and/or play without safety cards.
- Prepare signs with the name and picture of the creature for each participant to wear.
- Slow game down to a fast walk as needed.
- Use a whistle to signal when time is up.

Woodland Chase

- Narrate the game to decrease confusion as needed.

Motor Disabilities:

Overall:

- Choose a largely accessible site for the game, such as a gym floor or blacktop.
- Have "prey" walk quickly instead of running as needed.
- Decrease the size of the playing field as needed.

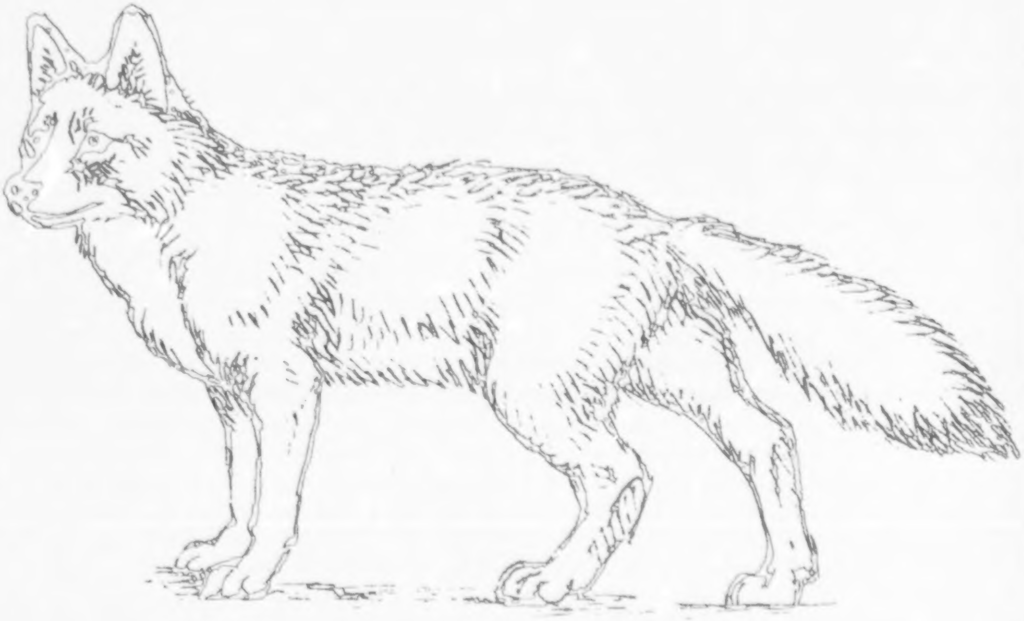
For participants with limited muscle strength, coordination, or dexterity of the hands:

- Have participants who have difficulty "tagging" others call out the "prey's" name once they are within a one to two foot area from the prey.

Visual Disabilities:

Overall:

- Prepare large print/ Braille animal cards for participants to wear.
- Use a timer or bell that participants can hear to end each round.
- Narrate the game to decrease confusion as needed.
- Have "prey" wear or carry bells to increase orientation.
- Have "prey" walk quickly instead of running as needed.
- Have partners assist with moving about the field and tagging "prey" as needed. This can be done through verbal orientation directions and/or allowing participants who have difficulty tagging others to call out the "prey's" name once they are within a one to two foot area from the prey.
- Have participants identify themselves before tagging participants with visual disabilities.
- Decrease the size of the playing field as needed.



ACTIVITY
27

Bird Behavior Hike

Summary:
Participants observe different bird behaviors.

Grade Level:
3-6

Time:
1 hour

Learning Objectives:
Participants will be able to:
◇ Identify different bird behaviors.
◇ Observe several bird behaviors in the wild.
◇ Describe how different bird behaviors help the birds to survive.

Materials Needed:
◇ Copies of the Bird Behavior Checklist
◇ Copies of the Bird Behavior Hike worksheet (optional)
◇ Regional bird field guides
◇ Pens or pencils
◇ Clipboards
◇ Clear contact paper and grease pencils (optional)

Background:

Bird behavior is generally dictated by different needs, including protection from predators and the elements, feather and wing maintenance, mating habits, and obtaining food and water.

If you are a good observer, you can witness many bird behaviors. Most birds must be wary of predators to protect themselves or their young. For this reason those who stand still and make minimal noise will likely observe the greatest number of birds and their behaviors.

Bird behavior can be quite complex and different for each species, but some guidelines are highlighted below.

Birds protect themselves from predators in a number of ways. Some may actually use their beaks and talons, but a large portion of birds try to avoid predators by **hiding** from them. **Camouflage** and different types of cover (grasses, bushes, etc.) help them. In the absence of cover or other protection, many birds will stand very still, and predators like hawks, which fly high and watch for movement, may miss them.

Many species find safety in numbers in a **flock**. A flock can consist of one species, as with Canada geese, or several; birds like grackle will tolerate many other species in their group. In a flock, many eyes and ears keep the group aware of any dangers present, as well as where to find food. Sometimes a flock will even band together to scare away predators.

Birds also sound **alarm calls** to warn the flock. Most calls are short and simple, and are usually the same from species to species.

Bird songs, on the other hand, are often very complex, and are so distinct a number of species can be identified from their songs. Normally, only adult males sing, and then only during mating season.

Courting time or not, almost all birds try to keep themselves clean. Many do this by **bathing** in water, while others roll around in dirt for a dust bath.

When they bathe, birds often get rid of feather parasites. By **preening** their feathers with their beaks and feet, they remove more parasites, arrange feathers, remove dirt, and help to waterproof their plumage.

All this maintenance work can help protect birds from the elements, and, if they **fly**, it can help them fly more efficiently. Some birds, like vultures, can catch air currents with their wings outspread and travel by soaring. Others fly by flapping their wings.

Bird Behavior Hike

ACTIVITY 27

Finally, birds eat a wide assortment of different foods. Diet can vary greatly between species and their habitats. Vultures and some others feed on **carrion**, the meat from dead animals. Hummingbirds eat off of nectar, insects, and small spiders. Other birds may eat different types of fruit, seeds, insects, fish, small mammals, amphibians, reptiles, or combinations of several of those choices. Participants might spot birds actually **feeding** or **foraging**, that is, looking for food.

What to Do:

1. Before starting this activity, investigate a local area where participants could go on a bird behavior hike. Ask for help from naturalists at local nature centers or local representatives from the state natural resources department.

2. Make copies of the Bird Behavior Checklist below, or make copies of your own checklist. Use the Bird Behavior Hike worksheet as a guide to accompany the checklist. If participants can differentiate between bird activities, have them design their own behavior guides. Be aware of the local bird population; if the checklist below is inadequate, or if there are other bird characteristics the participants might observe, make the appropriate changes.

3. Ask, *Have you ever watched birds? What kinds of things have you seen them do?* Tell participants that today they will have a chance to go out and observe different birds and their behaviors. Explain that they will first go over the basics of some different behaviors, and then they will be able to head out on a short walk in a local park or bird sanctuary.

4. Talk about and help define terms on the checklist. Discuss how the different behaviors help birds to survive. Ask the group to think about how they can find different birds, and where and when they might be more likely to see certain behaviors.

5. Pass out copies of the checklist and clipboards. Participants may work alone or in small groups. If possible, have volunteers oversee small groups. Consider laminating the checklists, or cover them with clear contact paper to make them stronger and reusable. Participants can then use grease pencils and wipe the marks off after every outing.

6. Take the group on a bird hike. Make sure they bring their clipboards and something to write with. If participants observe one or more of the behaviors on their checklist, have them mark the box next to the appropriate behavior, and then describe the bird and where they observed it. If you have time, some participants may want to look at a field guide and identify the type of bird.

7. Wrap up the hike by having the participants talk about what they found during the hike and what they learned about different birds.

For Younger Participants (Grades K-2):

For large groups, it is strongly recommended to split into groups of 8-10, head in different directions, and have volunteers oversee small groups. Younger participants may do especially well with the Bird Behavior Hike worksheet. Consider playing bingo with the worksheet — participants would mark on the sheet when they see a particular bird behavior. Whoever connects three behaviors horizontally, vertically, or diagonally wins.

For Older Participants (Grades 7 and Up):

1. Discuss various bird behaviors with the group, then ask participants to each pick a particular bird that might live in the area.

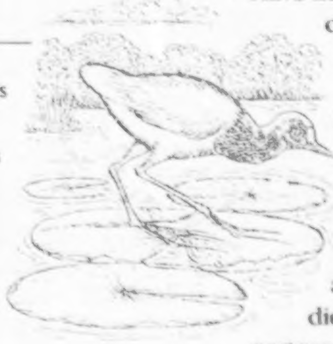
2. Have them research and find at least three identifying characteristics (e.g., color, song, shape, size, type of nest, time of year they may visit) using resource materials.

3. Have the group create a bird checklist, including the bird name, at least three characteristics, and several boxes they can check off, including when and where the bird was spotted.

4. Have the group go bird watching (once or many times!), and have them check off the birds they see each time they go.

Questions:

- What are some examples of bird behaviors?
- How do these behaviors help birds survive?
- How do different bird species differ in the behaviors they show?



Adaptations:

Refer to general adaptations on pages 11-16.

Hearing Disabilities:
- Use pictures/examples to illustrate each of the different behaviors.
- Have participants who are deaf identify singing and warning calls by the movements the birds make during these behaviors (i.e., outstretched neck, open beak, etc.).
- Have a set meeting place in case individuals get separated.
- Position yourself and the sign language interpreter so the participants can see you for further directions or warnings while on the trail.

Learning/Cognitive Disabilities:
- Use pictures and examples to illustrate each of the different behaviors. If desired, have the par-ticipants act out each behavior to help reinforce learning.
- Use a variety of bird calls and bird sound tapes to enhance the experience.
- Have field guides with large color pictures available.
- Have a set meeting place in case individuals get separated.
- Have participants who have difficulty writing complete the alternate worksheet or dictate information to a partner.

Motor Disabilities:
Overall:
- Select a largely accessible site for the activity.

For participants with limited muscle strength, coordination, or dexterity of the hands:
- Have participants who have difficulty writing complete the alternate worksheet or dictate information to a partner.

Visual Disabilities:
Overall:
- Use a variety of bird calls and bird sound tapes to enhance the experience.
- Clearly mark the area with a guide string on one side.
- Encourage partners to be interactive with the participant, vividly describing the behavior that each bird is engaging in to enhance the participants' experience. Have partners assist with field guide work and identifying birds as needed.
- Have resources available in alternative formats (Braille, large print, and audio cassette).

For participants with low vision:
- Provide large print version of the Bird Behavior Checklist. Have clipboards and thick black markers available for use.
- Provide binoculars.

For participants who are blind:
- Have a Braille version of the Bird Behavior Checklist available.
- Have small tape recorders available for participants to record their information or dictate input to their partner.
- Consider completing a bird call hike instead. Listen to a bird call tape and practice identifying different calls. Have participants practice making several bird calls. Go on a bird call hike and keep track of as many different birds your group can identify.

Bird Behavior Checklist

WORKSHEET

Date:

Time:

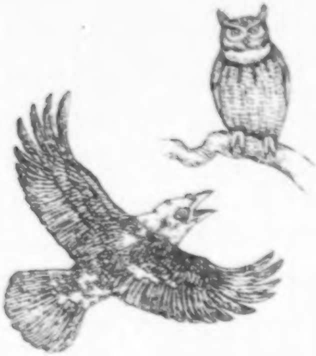
Weather:

BIRD BEHAVIOR	TALLY MARKS	DESCRIPTION/ LOCATION OF BIRD(S)
Example: Flocking	/////////	Looked like a flock of geese flying overhead, near lake
Hiding		
Flocking		
Bathing		
Flying		
Preening		
Singing		
Feeding		
Giving an alarm call		
Foraging		

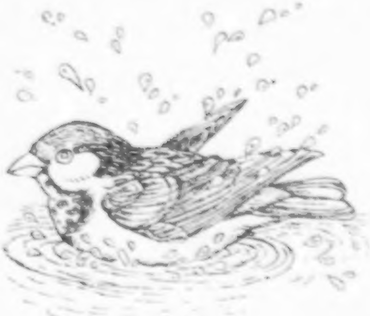
WORKSHEET

Bird Behavior Hike

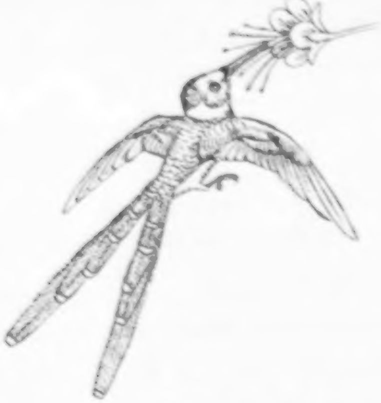
DIRECTIONS: Place a tally mark next to the behavior each time you observe it on your hike.



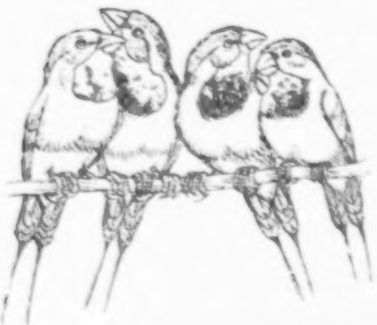
Alarm Call ______



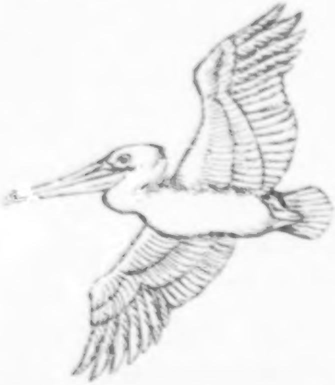
Bathing ______



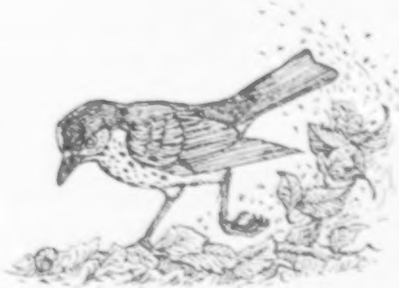
Feeding ______



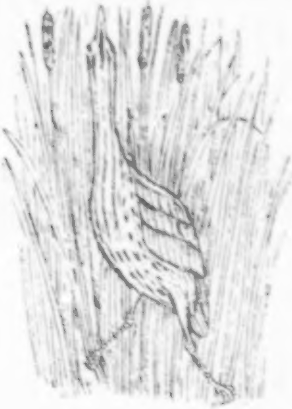
Flocking ______



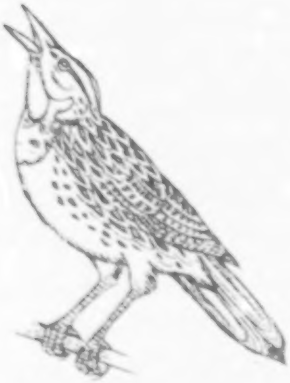
Flying ______



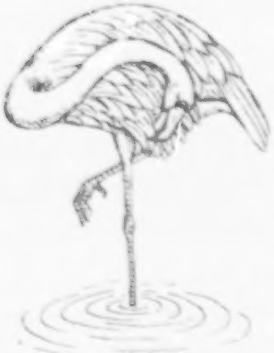
Foraging ______



Hiding ______



Singing ______



Preening ______

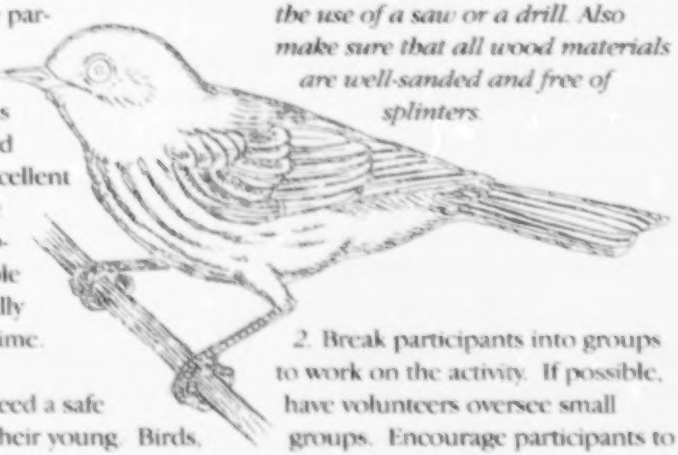
Building Birdhouses and Feeders

ACTIVITY 28

Background:

In order for a place to offer a habitat for any living thing, it must offer four basic elements: food, water, cover, and areas to reproduce and raise young. A bird feeder and/or birdhouse can help take care of some of the basic needs for local birds.

Ideally, a planned habitat will have as many food-producing plants available as possible, so that the area will meet food needs throughout the year. Birds are particularly fond of berries and other types of seeds. A bird feeder is an excellent way to provide seeds in the absence of suitable plants, especially for the wintertime.



Animals also need a safe place to raise their young. Birds, for example, need a safe place for their nests. Birdhouses can be placed on posts, trees, and buildings to help meet this need. Some birds can be more particular about their houses than others, and so the house you build and the amount of care taken may affect what type of visitors arrive. The nesting shelf instructions included here can attract nesting birds such as phoebes, American robins, and barn swallows.

Part A: Building Bird feeders

What to Do:

1. Ask participants, *What do birds need in their habitat to survive? What kinds of things can WE do to help them?* Follow the instructions below, or simply use bird feeder kits donated from a local hardware store or bird watcher's club. Follow written directions that come with kits.

***Important:** Make sure an adult does any of the work that requires the use of a saw or a drill. Also make sure that all wood materials are well-sanded and free of splinters.*

2. Break participants into groups to work on the activity. If possible, have volunteers oversee small groups. Encourage participants to help each other. Assist them in cutting holes in the containers for the birdseed and the dowel. Attach strong wire to the top of the feeder for hanging from a corner of a building or the branch of a tree (see diagram). Fill with birdseed, and hang.

3. Feeders can be hung from a tree branch, left on the ground or placed on a stump or wall. Encourage participants to select a site where they

Summary:

Participants learn how to build simple birdhouses and bird feeders.

Grade Level:

3-12

Time

1 to 2 hours to make; several days for observations

Learning Objectives:

Participants will be able to:

- ◇ Understand the importance of food and other basic needs for all wildlife.
- ◇ Create a feeder and/or home for birds.
- ◇ Observe the use of their feeders by birds and other animals.

Materials Needed:

PART A: BUILDING BIRD FEEDERS

- ◇ Strong string or wire
- ◇ Empty milk cartons or 2-liter plastic soda bottles
- ◇ 1/4" diameter dowel or small stick long enough to go through the carton and have room for a bird to sit on either side
- ◇ Birdseed

PART B: BUILDING BIRDHOUSES

- ◇ 40-inch length of 1x12-inch pine or fir shelf board
- ◇ 20 1 1/4" galvanized wood screws or suitable nails
- ◇ Screwdriver
- ◇ Sandpaper
- ◇ Drill
- ◇ Hammer
- ◇ Safety goggles

Building Birdhouses and Feeders

have already observed birds. Have small bags of birdseed ready to give the participants when they take their feeders home. Remind participants that some areas are safer than others; a feeder on the ground makes birds vulnerable to cats, and a feeder in the open (away from the safety of brush) may make birds vulnerable to predatory birds, like hawks.

4. Have participants hang their bird feeders and return to observe them for several days in a row. *Do they observe any birds feeding there?* If there are any problems (i.e., squirrels scaring away the birds, eating all the food, etc.), have the group brainstorm ways to address these problems and go out and take action. If you wish, have participants record their observations of the bird feeding stations. *Do they notice any changes depending on the time or weather conditions of the day?* If possible, have participants use field guides to identify the birds using their feeders.

Part B: Building Birdhouses

What to Do:

1. Discuss the basic habitat needs of birds. *How can we help to provide these?* One way is to provide birdhouses. Follow the instructions below, or simply use birdhouse kits donated from a local hardware store or bird watcher's club. Follow written directions that come with kits. Consider making nesting materials (cut grass, twigs, pet hair) available in the vicinity of the birdhouse.

Important: ***Make sure an adult does any of the work that requires the use of a saw or a drill. Also make sure that all wood materials are well-sanded and free of splinters.***

2. An instructor or other adult should do the following preparatory work: Cut the 40-inch board into sections as per the diagram. If participants are using screws, pre-drill holes to avoid splitting the wood. For nails, consider marking the area where the nails need to go with a small "x." Drill drainage holes in the floor (Piece 4) of the nesting shelf. Break participants into groups to work on the houses. If possible, have volunteers oversee small groups. Encourage participants to help each other.

3. Pass out the diagram to each group. Help participants through the assembly process. Have participants can put the pieces together following the numbers on the diagram (e.g., attaching board #1 to board #2, and so forth). They should use all the screws or nails.

4. The nesting shelf can be mounted to a building (a participant's house, for instance), or trees. It should be placed 6 -10 feet off the ground on a north-facing wall or tree trunk. Adults should be responsible for mounting the shelves.

For Younger Participants (Grades K-2):

These participants may help with putting things in the right place, but should not use hammers or other tools.

Questions:

- What do birds need to survive?
- Why might some of these needs be unavailable?
- How can humans help birds?

Building Birdhouses and Feeders

ACTIVITY 28

Adaptations:

Refer to general adaptations on pages 11-16.

Hearing Disabilities:

- Demonstrate each step as you give directions. Have a completed project to show participants.
- Position yourself and the sign language interpreter so the participants can see you for further directions or seeking assistance.

Learning/Cognitive Disabilities:

- Demonstrate each step as you give directions. Simplify directions as needed. Have a completed project to show participants.
- Provide pre-cut pieces as needed.
- Space pairs/small groups out for safety purposes.
- Have partners coach throughout the activity as needed.
- Make sure each participant has completed each step before moving on.

Motor Disabilities:

For participants with limited muscle strength, coordination, or dexterity of the hands:

- Use adaptive scissors to make required cuts as needed (feeder).
- Provide pre-cut pieces as needed.
- Have partners assist with assembly as needed.

Visual Disabilities:

Overall:

- Demonstrate each step as you give directions. Have a completed project for participants to see/feel.
- Have a copy of the directions in both large print and Braille.
- Space pairs/small groups out for safety purposes.
- Provide pre-cut pieces as needed.
- Encourage partners to provide good orientation directions and coach throughout the activity.
- Have project pieces separated out by function (i.e., side pieces, top, bottom); place in piles or bags. Place an index card labeled in large print and Braille on top of each of the piles or bags.
- Make sure each participant has completed each step before moving on.

For participants with low vision:

- If the work surface does not provide enough color contrast, place a piece of black paper under the project.

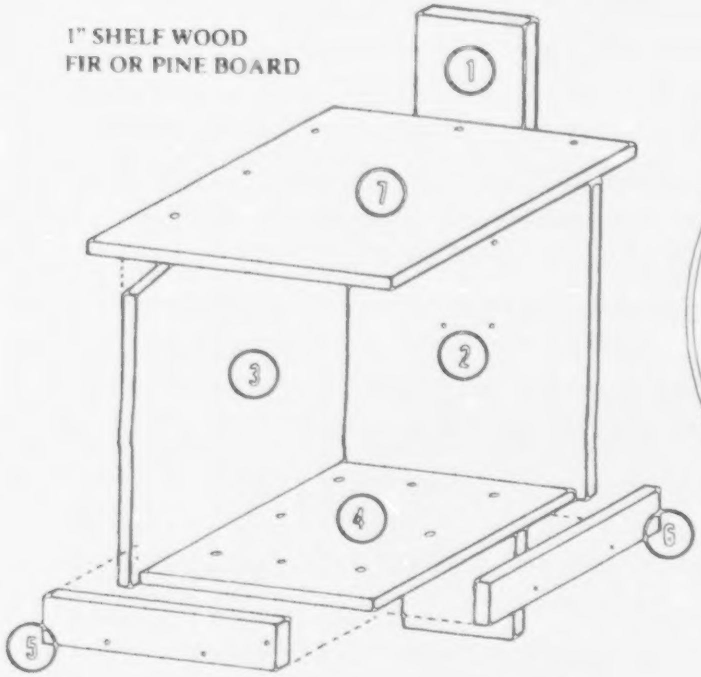
For participants who are blind:

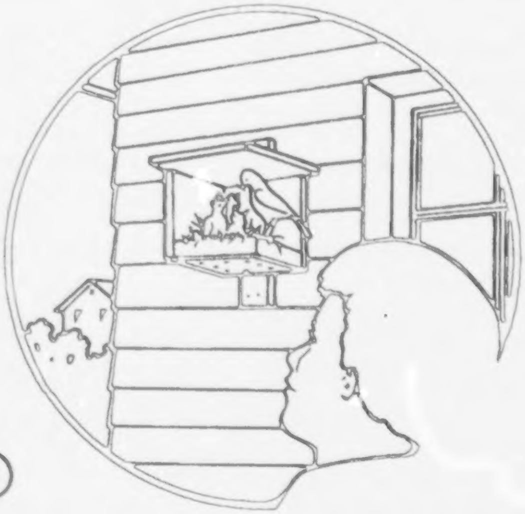
- If possible, have partners put together a birdhouse or feeder at the same time and describe each step to the participant. Have the participant feel the project at each step.

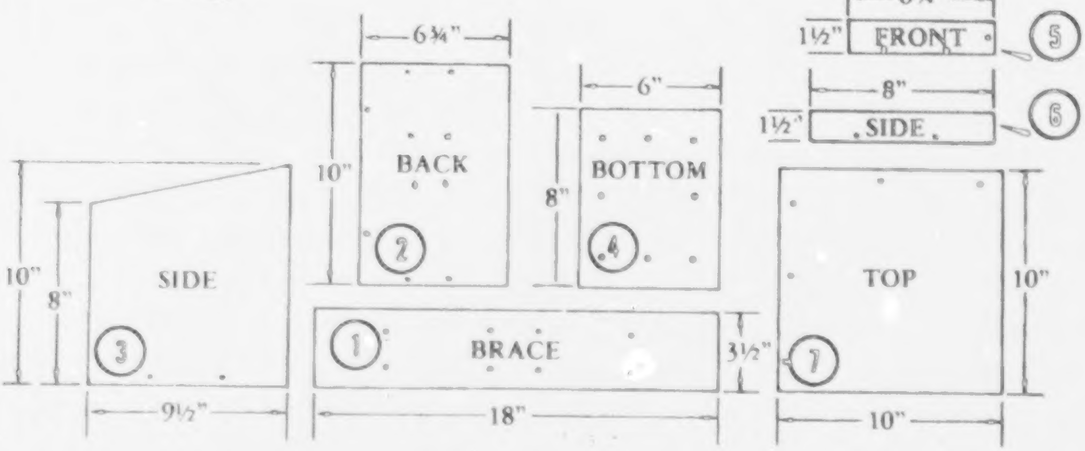
WORKSHEET

Birdhouse Diagram

DIRECTIONS: Use a 40 inch length of 1 x 12 inch pine or fir shelf board to construct the nesting shelf. Use 1 1/4 inch galvanized wood screws or suitable nails. Drill holes to avoid splitting the wood. Drill drainage holes in the floor (Piece 4) of the nesting shelf.


1" SHELF WOOD
FIR OR PINE BOARD
1
7
3
2
4
6
5

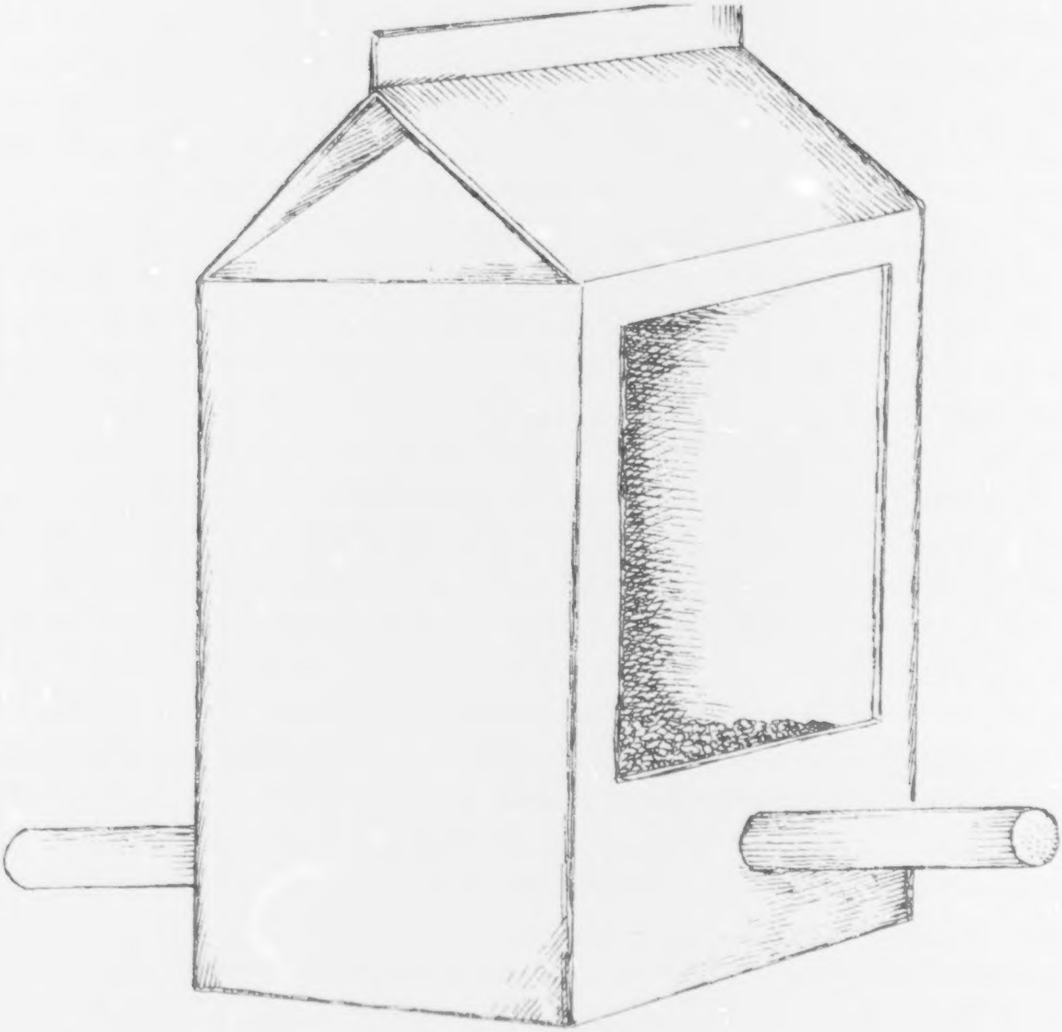



6¾"
1½"
FRONT
5
8"
1½"
SIDE
6
6¾"
10"
BACK
2
6"
8"
BOTTOM
4
10"
8"
SIDE
3
9½"
1
BRACE
3½"
18"
TOP
7
10"
10"

Bird Feeder Diagram

WORKSHEET

DIRECTIONS: See page 179 for full details.



ACTIVITY
29

Spider Sensations

Summary:

Participants discover how web-spinning spiders find their prey by feel.

Grade Level:

K-6

Time:

30 minutes

Learning Objectives:

Participants will be able to:

- ◇ Identify the parts of a spider.
- ◇ Understand the hunting strategy of web-spinning spiders.
- ◇ Discuss different adaptations of spiders.

Materials Needed:

- ◇ Pictures of orb-weaver and other spiders
- ◇ A large, labeled poster of a spider
- ◇ Several blocks of wood with 5 pieces of 6' yarn tied to large staple in center of block
- ◇ Several blindfolds

Background:

Spiders belong to a huge group of animals called **arthropods (phylum Arthropoda)**, which means that they have jointed legs and a hard outer skeleton rather than a backbone. Arthropods also include insects, crustaceans, and centipedes. The portion of arthropods to which spiders belong are called **arachnids (class Arachnida)**. This class also includes scorpions and mites.

All arachnids have four pairs of legs, no antennae or wings, and two body segments. The front section of a spider is called the **prosoma**, while the rear is its **abdomen**. Arachnids also have well-developed jaws that are tipped with fangs, and spiders' fangs are usually poisonous, though most spiders' venom is too weak to do much harm to people. Though many species have multiple eyes (often eight of them) most spiders do not see very well. They use sensory feelers directly in front of their mouths, called **pedipalps**, to feel and handle their prey. All spiders use silk in one way or another, spinning it from **spinnerets** at the rear of their abdomen.

Not all species make webs from their silk. Some make silk to protect their young, others make trapdoors, and some line their burrows with it. Of those that do spin webs to capture their prey, **orb-weavers (family Araneidae)** are the most numerous. Orb-weavers design amazingly intricate webs to catch insects. The strands of silk are also very strong; if a spider could make a one-inch thick silk strand, it would be stronger than a steel cable of the same thickness. Orb-weavers have a very developed sense of feel, and relatively weak vision. When something becomes entangled in the sticky strands of the web, the orb-weaver finds the insect or other prey by feeling vibrations and tensions in different threads. The spider will then wrap its prey in silk, bite it to paralyze it, and eventually, eat it.

What to Do:

1. Ask participants if they know the difference between insects and spiders. Give a basic introduction to spiders; show pictures and use a large, labeled diagram of a spider to help illustrate key points. Ask the group how spiders can be beneficial to humans.

2. Discuss different adaptations of different spiders (e.g., some spiders use their silk to make a trapdoor to capture their prey, they use their venom to paralyze their prey, etc.). Discuss the characteristics of web-spinning spiders. Ask participants if they know how web-spinning spiders capture their prey. Explain that the game "Spider Sensations" simulates how web-spinning spiders capture their prey.

Spider Sensations

ACTIVITY 29

3. Divide participants into groups of six and give each a wooden block, with yarn strands attached, to put on the floor.

4. Designate one participant to be the spider, crouched next to the block with eyes blindfolded, and the remaining five to be insects, who each take one strand of yarn and radiate out in all directions from the spider. The strands should be held taut, next to but not touching the ground. The spider's hands rest lightly on top of them in order to feel any vibrations.

5. Next, the leader points to one insect, who plucks his or her strand once. The spider crawls to the end of the strand that moved, captures the insect, and then they change places. If the wrong insect was captured, the spider gets one more try before they switch places. Continue until everyone has a chance to be the spider.

6. When all are done, ask, *What did you learn? How is this method of hunting prey different from the ways other animals' hunt? Would this method of hunting work for a lion? An eagle? A human?*

Questions:

- What characteristics set spiders apart from insects?
- What do different species of spiders do to capture their prey?
- How do web-spinning spiders capture their prey?

Adaptations:

Refer to general adaptations on pages 11-16.

Hearing Disabilities:

- Create an interactive display of a spider to help illustrate the discussion. Make and label spider part "puzzle pieces" out of cardboard and secure them to a piece of poster board with Velcro. Draw the outline of the spider on the poster board as a guide. Give participants a labeled part and have them add these to the poster board as the functions of each part are discussed. (To make a more permanent version, put pieces of Velcro on the back of the cardboard parts and use a felt-covered board.)
- Have a plastic spider for participants to explore.
- Demonstrate each step of the game as you explain it.

Learning/Cognitive Disabilities:

- Create an interactive display of a spider to help illustrate the discussion. Make and label spider part "puzzle pieces" out of cardboard and secure them to a piece of poster board with Velcro. Draw the outline of the spider on the poster board as a guide. Give participants a labeled part and have them add these to the poster board as the functions of each part are discussed. (To make a more permanent version, put pieces of Velcro on the back of the cardboard parts and use a felt-covered board.)
- Have a plastic spider for participants to explore.
- Demonstrate each step of the game as you explain it.
- Provide verbal coaching directions for spiders as needed.

Motor Disabilities:

- Place the block of wood on a lap tray or another chair when the spider uses a wheelchair. Have the insects sit in chairs.

- Wrap yarn loosely around participant's wrist or the arm of his or her wheelchair if they have difficulty holding it. If wrapping around the wrist, make sure to check periodically to see that it's not too tight.
- Make sure that participants are spaced out enough for safety purposes.
- Assist participant in maneuvering

toward the insects as needed.

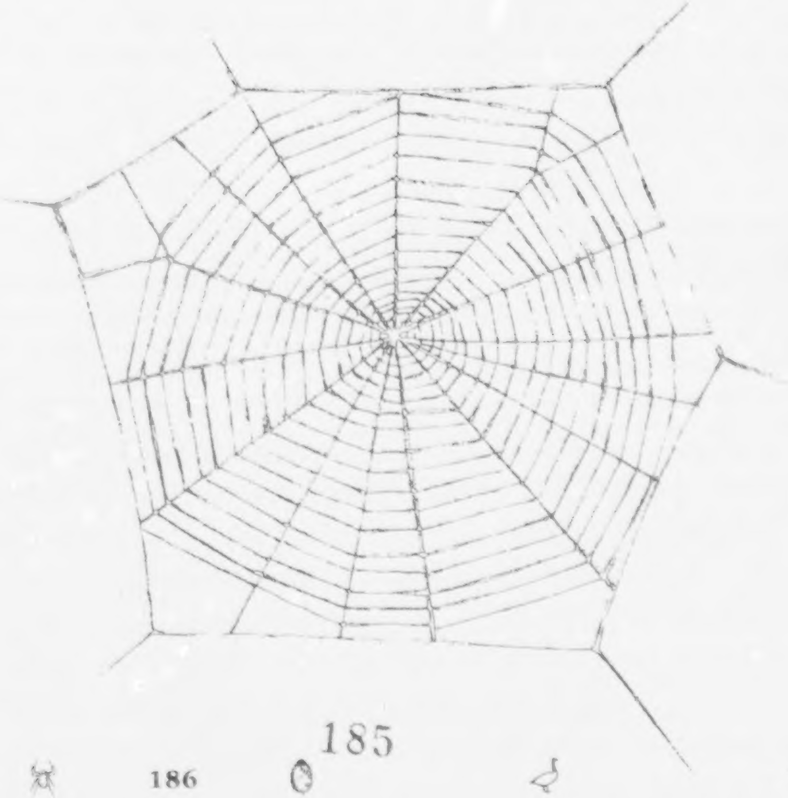
- If the spider has limited mobility of upper extremities, but use of lower extremities, have them sit in a chair in the center, shoes off, and feel the web with their feet. All insects should be seated on the floor.

Visual Disabilities:

Overall:

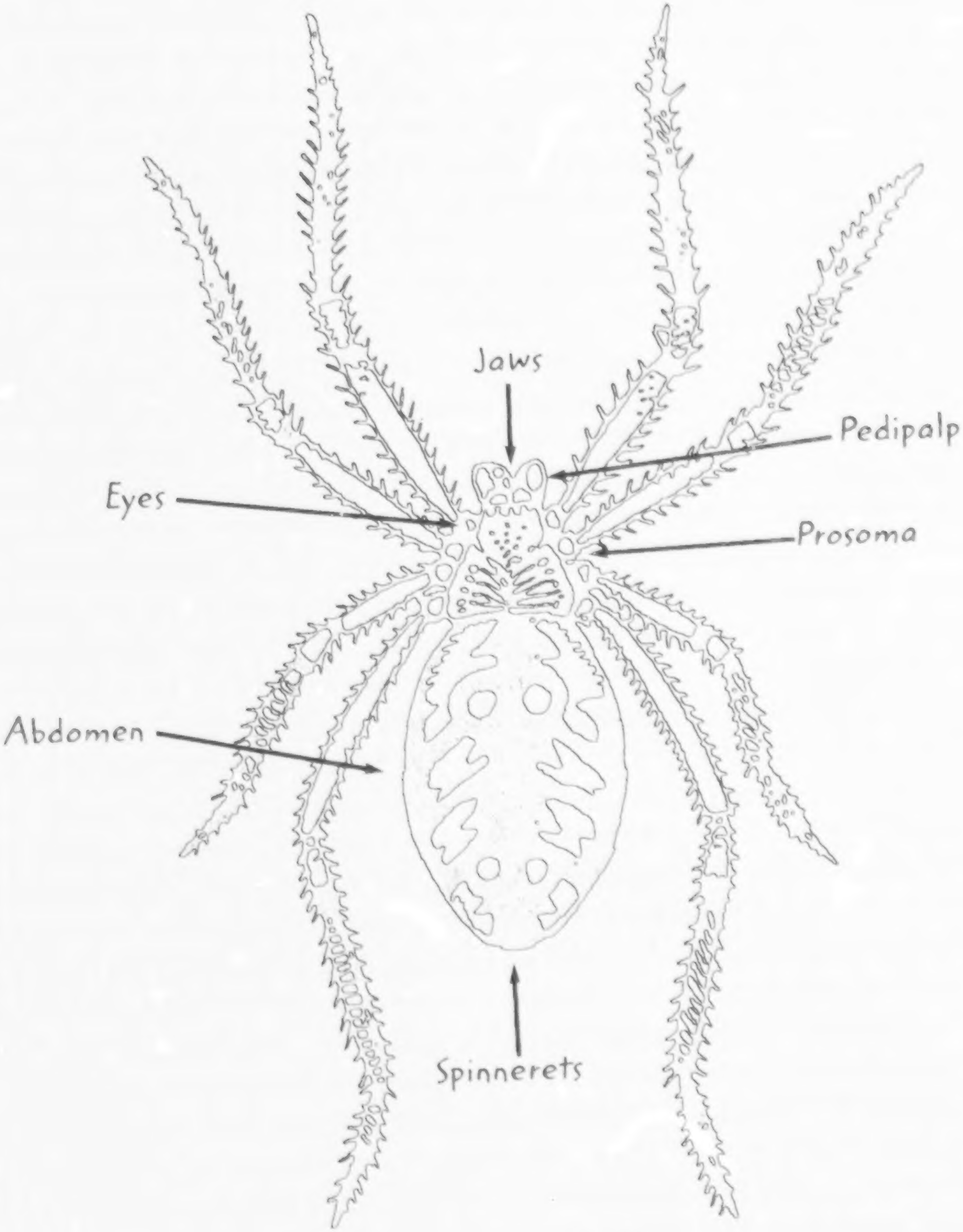
- Create a tactile spider poster using different fabrics (e.g., corduroy, silk, felt, etc.) for each of the parts. Label the poster in large print and Braille.
- Have a plastic spider for participants to explore.
- Tap the participant on the shoulder to signal when it is his or her turn to pluck the string.
- Have participants use string as their guide to find the insects. Give verbal cues as needed.
- Make sure that participants are spaced out enough for safety purposes.
- Have participants identify themselves to players with visual disabilities before capturing them.

Adapted with permission of the publisher: Lingelbach and Purcell, eds. Hands-On Nature, 2nd edition. Woodstock: Vermont Institute of Natural Science, 2000.



Spider Sensations

WORKSHEET


Jaws
Pedipalp
Eyes
Prosoma
Abdomen
Spinnerets

ACTIVITY
30

Small Seek

Summary:

Participants investigate the world of decomposers first-hand.

Grade Level:

K-8

Time:

45 minutes

Learning Objectives:

Participants will be able to:

- ◇ Explore how things decompose in nature.
- ◇ Identify the organisms that live in, feed on, or lay eggs on a rotting log.
- ◇ Understand the role of decomposers in the ecosystem.

Materials Needed:

- ◇ Hand lenses (a plastic "bugbox" with a lens in the lid is ideal)
- ◇ Paper and pencils/markers
- ◇ Copies of the Small Seek worksheet (optional)

Background:

An amazing world of plants, fungus, lichens, and tiny creatures exists in, under, and on top of a rotting log. Most of the living things in this realm actually help the process of **decomposition**, as they help break down dead wood and recycle the nutrients stored in it.

Often plants and fungus will grow out of nutrient-rich, rotten logs. They tear the decaying matter apart as their roots (plants) or **filaments** (fungus) spread. **Mosses** (small, soft, green plants with no roots) and **lichens** (combination of fungus and algae, vary in color and have odd, thin, knobbed, leaf-like structures which tend to grow flat against trees or rocks in somewhat round patches) also grow on decaying matter. Mosses keep the area moist and may attract other plants and animals. A mild acid found in lichens aids in the process by eating away at bark. Boring beetles eat into the inner bark of dying and dead trees. They, like termites, carpenter ants, and sowbugs who generally follow, help break down the wood by chewing it and tunneling into it.

Spiders, centipedes, and other predators follow; they eat bugs that eat the wood. Some birds and mammals dig into the bark and eat the wood-chewing prey and their small predators.

In addition, many animals make their homes in rotting material, like salamanders, which avoid the heat of the day to hunt at night, and some beetles, which spend the winter inside such logs. Some insects, including certain wasps and beetles, lay their eggs in decaying matter. All of these organisms, as they move into or out of the wood, contribute to wearing it down into smaller chunks.

Eventually, the wood will crumble into finer and finer pieces, until it is essentially a very fertile soil, available for seeds to grow in and the nearby trees to soak up nutrients from.

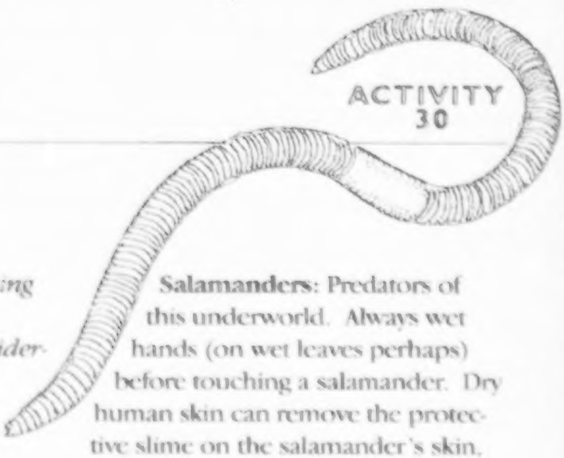
What to Do:

1. Ask participants what the word decomposition means. Introduce the concept of decomposition and discuss some organisms that play a role in it. Tell participants that they will have a chance to go outside and see different stages of decomposition, and what kinds of things move the process along. Before going outside, give participants a copy of the Small Seek worksheet so they can have some ideas of the kinds of creatures they will be looking for.

2. Once outside, look carefully in dark, moist places. Check under rocks, layers of leaves, loose bark on dead wood, under rocks near water, and under boards or logs

Small Seek

ACTIVITY
30



that have been on the ground more than one week.

3. Before looking for any moving critters, examine a big rotten log, or a few logs if participants need more room to see. Try to see how many types of plants and fungus they can find growing on the log. Ask, *Do any lichens or moss grow on this log? What are these things doing here?*

4. Next, have the participants look at the log and the soil around it. The following questions can help stimulate the discussion. *Is it pretty solid? Is it falling apart? What is happening to the log?* If they immediately come up with textbook answers (e.g., "It's decomposing."), try to have them find evidence. *Where is it decomposing? What is it decomposing into? Is there soil nearby that appears as if it backs up this idea?*

5. Look in moist, dark places for animals in the list that follow. To start, turn over one log to explore; move on as needed. A few logs may suffice, though sometimes participants will want to go off and turn over several logs, rocks, and wet leaves. Always return rocks and logs to the position they were originally found. Encourage participants to carefully place the organisms in bug boxes for a closer look at them. But be sure to return them shortly after examining them.

Note: Be cautious when searching in these places. Make sure to review appropriate safety considerations on page 17-18.

Pillbug: Grey, oblong creature with many segments and many legs; rolls up in a ball when picked up.

Sowbug: Similar to pillbug but does not roll up; has a "skirt" of gray "legs" dragging behind.

Centipede: Long body and many legs that stick out on either side of the body; moves rapidly. Do not handle, they can bite!

Millipede: Lots of short legs under a long, tube-like body; rolls up when disturbed.

Snail or slug eggs: Translucent, slightly sticky whitish eggs, 1mm (or 1/8 of an inch) in diameter.

Ants: Will rapidly try to move whatever they have stored in the place that has been disturbed. Very tiny, round eggs. Larvae like tiny caterpillars, pupae (most likely to be found close to the surface) encased in cream-colored oblongs. During cold months there may be tiny insects called aphids in an ant chamber. In the spring, the ants will carry the aphids to a growing stem, protect them from predation, and "milk" them of their sweet secretions.

Salamanders: Predators of this underworld. Always wet hands (on wet leaves perhaps) before touching a salamander. Dry human skin can remove the protective slime on the salamander's skin, leaving the animal vulnerable to infection or abrasion.

Earthworms: Long pink worms with a slightly thicker band of skin near the head end. The ring is the site where genetic material is exchanged during mating. Both individuals will later lay fertile eggs.

Ground beetles: Fast shiny black beetles.

Mycelium: White or orange threads, branching and slightly elastic; these are the food-getting strands of mushrooms. The mushrooms that grow above ground are the spore-producing part of the whole organism. Mushroom mycelium from a single fungus may weave through acres of soil.

Spiders: the ground-living funnel-weavers make dense, sheet-like webs; a quick, hairy spider with no web is probably a wolf spider. Females may be carrying a white ball of eggs or a dense cluster of babies on their bodies.

Slugs: Slimy, muscular oblongs; look on one side for a "porthole" that is used for breathing; snails have similar body shapes but carry shells and live in soils that have lime in them.

6. Have participants describe and draw in nature journals the creatures they find as they explore the habitat of darkness and moist soil. Discuss what they found. Ask them to figure out what function each creature has in the process of decomposition. Wrap up by asking participants, *Why is it a good thing all these different organisms do what they do?*

Questions:

- What happens to a log when it decomposes?
- What are some of the organisms that contribute to the decomposition process?
- What would happen if nothing ever decomposed?

Adaptations:

Refer to general adaptations on pages 11-16.

Hearing Disabilities:

- Use pictures of different decomposers to help illustrate the introduction to the activity.
- Have a set meeting place in case individuals get separated.
- Position yourself and the sign language interpreter so the participants can see you for further directions or warnings while on the trail.

Learning/Cognitive Disabilities:

- Use pictures of different decomposers to help illustrate the introduction to the activity.
- Have a set meeting place in case individuals get separated.
- Provide clipboards.
  Have participants who have difficulty writing circle creatures on the worksheet as they find them.

Motor Disabilities:

- Choose a largely accessible site (i.e., level, no standing water).
- Allow participants who use wheelchairs and are comfortable doing so to transfer to a sheet/towel by the log to get a good view. If it is too muddy or they are unable to transfer, move the log to a picnic table for observation. Be careful not to overly disturb the area. Return the log to its location when you are done.

For participants with limited muscle strength, coordination, or dexterity of the hands:

- Build up the handles of the hand lenses with putty, foam, or bandage material.
- For participants who have difficulty holding hand lenses, have eyeglasses with magnifying lenses, tabletop magnifiers, or magnifiers that can be worn around the neck.
- Build up pencils with tape or bandage material a needed.
- Provide clipboards.

Visual Disabilities:

Overall:

- Clearly mark the trail with a guide string on one side.
- Have participants sit on a sheet/towel next to the log to explore the area more easily. Move the log to a picnic table for closer view if it is too muddy to sit on the ground. Be careful not to overly disturb the area. Return the log to its original location when you are done.

For participants with low vision:

- Provide a large print version of the worksheet.
- Provide clipboards, thick black markers and drawing paper.
- Provide a variety of magnifiers.
- Provide a lantern or flashlight to illuminate the area to enhance visibility as needed.

For participants who are blind:

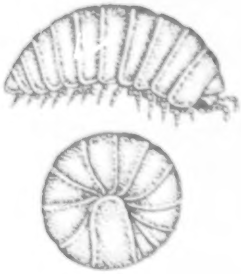
- Have partners provide guided touch and vivid descriptions of the log and its inhabitants. Encourage participants to touch harmless insects and explore the log.
- Have clay available for participants to make models of any insects or other decomposers they touch.

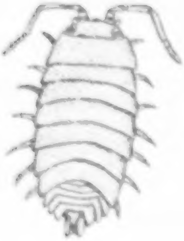
© 1994 Hunken, Jorie. Adapted with Permission from "Small Seek", Hunken, Jorie, Ecology for All Ages: Discovering Nature Through Activities for Children and Adults, The Globe Pequot Press, 1994, pages 13-15.

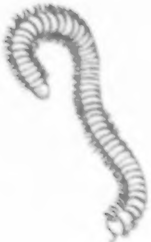
Small Seek

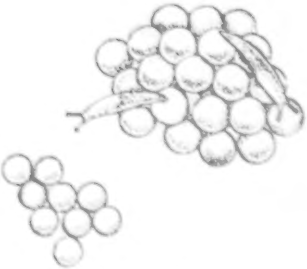
WORKSHEET

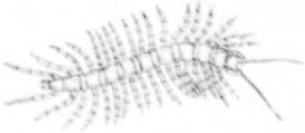
DIRECTIONS: Look for the following creatures on, under, or in a rotting log (or under rocks).

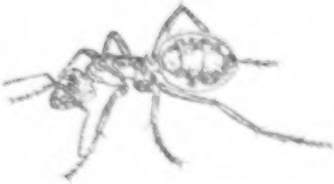

Pillbug

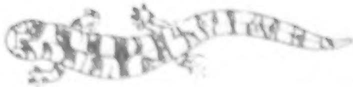

Sowbug

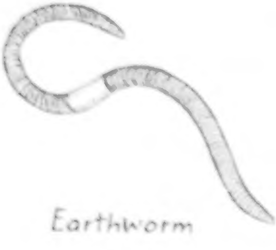

Millipede

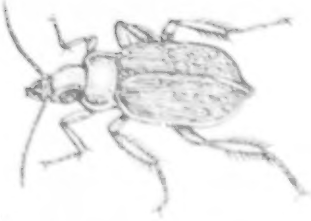

Snail or slug eggs

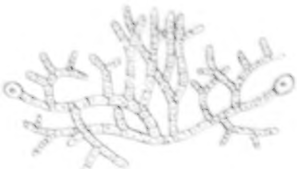

Centipede

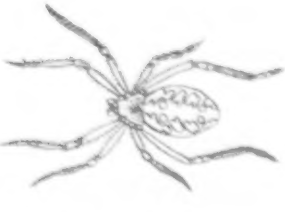

Ant

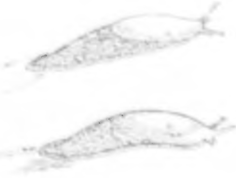

Salamander


Earthworm


Ground beetle

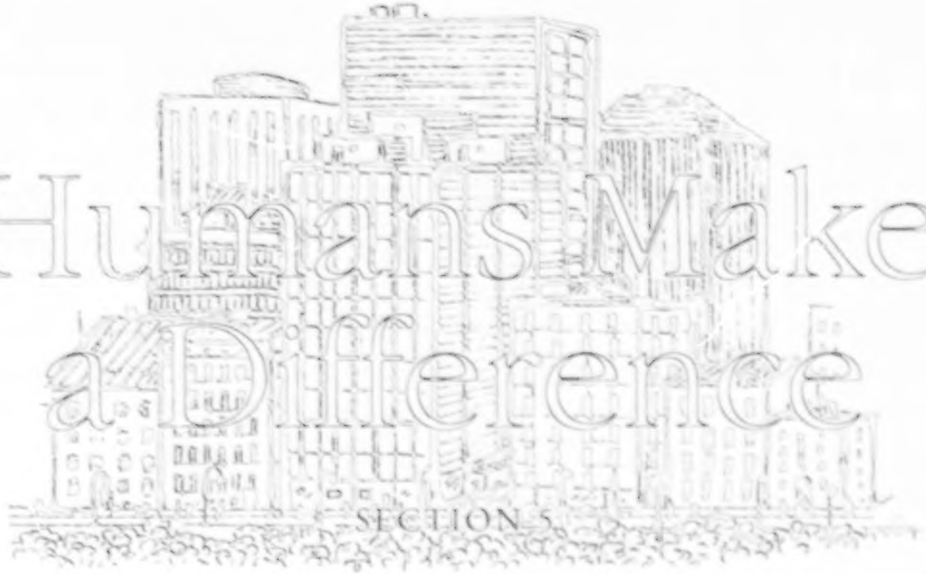

Mycelium


Spider


Slugs

Humans Make a Difference

SECTION 5



BEST COPY AVAILABLE

ACTIVITY
31

Stop! Erosion!

Summary:

Participants explore the concept of soil erosion, when it can become an ecological problem, and what they can to do prevent its negative effects.

Grade Level:

3-6

Time:

1 hour or more

Learning Objectives:

Participants will be able to:

- Investigate the behavior of water as it relates to soil.
- Define soil erosion.
- Devise methods to control soil erosion.

Materials Needed:

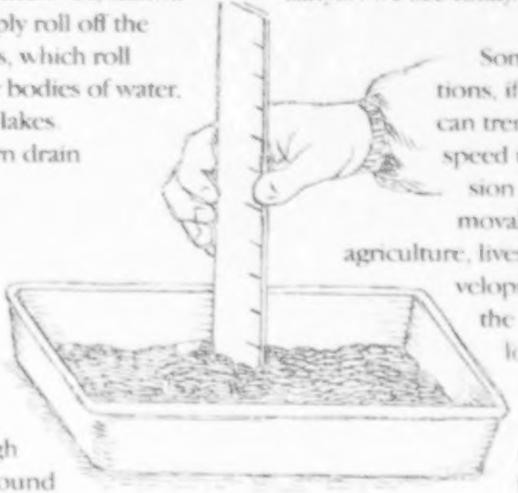
- 1 bushel bag of potting soil (depending on group size)
- Watering can
- 1 plastic or aluminum pan per group, about 10" X 20" or larger (large frozen lasagna trays work well for this)
- 1 box toothpicks per three groups
- 5-10 tongue depressors per group
- Garbage bag of leaves or grass clippings (about 2 handfuls per group)
- 1 thick plastic sheet (about 10" X 10", cut from a tarp) per group
- 1 piece of cloth (10" X 10") per group
- 1 10" X 10" piece of cardboard per group
- 1 roll of string per group
- 1 roll of tape per group
- Enough scissors for everyone in the group

Background:

When rainwater falls to the ground, it generally does one of three things. It may **evaporate** into the atmosphere as water vapor (eventually, this water vapor may condense into a cloud and rain back down again). It may **percolate** down through the soil into large underground reservoirs of water, called **ground water**. Or, rainwater may also simply roll off the land into streams, which roll down into larger bodies of water, such as rivers or lakes. These may in turn drain into the ocean.

As rainwater flows downhill, it often flows over and through soil. On its way, it may filter through spaces in and around soil particles, plant roots, and other organic matter. This process actually slows the flow of water and allows a great deal of it to soak into the soil. Plants absorb some of this water, and a good deal of it will eventually percolate down into the ground water. Most plants hold a considerable amount of soil in place with their roots, though if water is moving fast enough, or for a long enough period of time, it will wear away almost anything, plants, soil and so on.

This process of wearing away is called **erosion**. Water, wind, glaciers, earthquakes, and volcanos are all forces that contribute to erosion. These forces may erode soil, coastlines, rock, etc. A good example of natural erosion is the Grand Canyon, where millions of years of the Colorado River running over layer after layer of soil and rock have contributed to the great canyon we see today.



Some human actions, if unchecked, can tremendously speed up the erosion process. Removal of plants for agriculture, livestock, or development loosens the soil and allows more of it to run into streams and rivers. Also, the less **permeable** (able to let water pass through) a surface is, the faster water runs off of it. So, rain hitting asphalt or concrete will move downhill much faster than rain hitting soil full of plant roots and air pockets. The faster water moves down off these surfaces, directly or through sewer drains, the greater power it has to erode stream- or riverbanks, and the greater the amount of soil it carries away with it. Therefore, the more land that is paved and the more permeable surfaces (fields, forests, etc.) that are replaced with buildings, parking lots, roadways, etc., the faster rainwater rolls into streams and rivers, and without mechanisms present to slow it down, the more soil is eroded into the water.

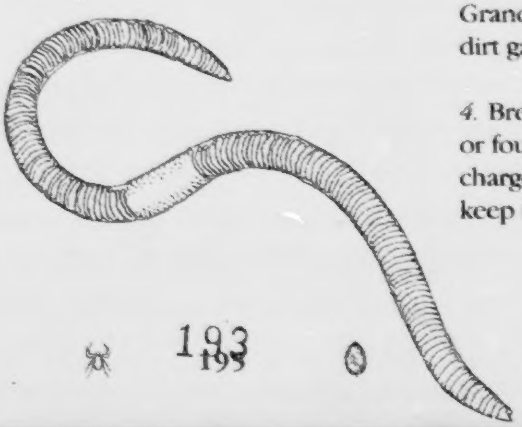
One of the problems associated with high levels of erosion is a great loss of rich, productive soil. Since the top layer of soil is generally the richest in nutrients, most plants cannot survive without enriching the soil with additional fertilizers after it is gone. When super-rich fertilizers (especially synthetic ones) run off into streams, they can cause water pollution problems. Severe erosion of any sediment (such as soil or organic matter) into streams also diminishes water quality and harms many aquatic organisms. For example, oysters, submerged grasses, and other organisms in the Chesapeake Bay have experienced incredible population declines partially due to the effects of suspended particles from soil runoff.

To reduce the amount of soil eroding into streams, local governments (and others) have developed Best Management Practices (BMPs). Examples of BMPs include:

- Promoting native plant cover in landscaping.
- Replanting areas cleared by logging.
- Monitoring water that enters and leaves logged or other disrupted areas, to identify areas with erosion problems.
- Planting terraces on steep slopes.
- Creating catch basins (basins that fill up like ponds and drain very slowly to slow water down and catch sediments), and planting trees around them.
- Leaving green or replanting zones in riparian (on or near the banks of a waterway) areas.

What to Do:

1. Ask participants how water behaves when it rains. ***Where does it go? What are some effects it has?*** If it happens to be a rainy day, have them watch the rain and determine where it is going, where it forms puddles, where it moves really quickly, where it moves slowly. If it is not a rainy day, have them imagine what the rain does when it runs down their street and/or off their yard. ***Which way does it go? What happens to different surfaces when it rains?*** Have them list different surfaces and the effect of rain on those surfaces.



2. Tell participants they are going to take part in an experiment to explore soil erosion and how to reduce it, but before they do that they will need to understand the concept of soil erosion.

Ask participants, ***What is soil erosion?*** Discuss the concept, including how water wears down or washes away the soil. Ask, ***What other forces contribute to erosion?*** (wind, surf, glaciers). ***What substances can be eroded?*** (rock, soil, concrete, wood, almost any other solid).

3. If possible, take participants on a walk around the grounds. Have them identify areas that have been worn away—patches of grass missing, exposed roots and rocks, mulch, leaves, and other objects that have run down a slope and left a trail, and so on. Ask participants to try to distinguish between areas eroded by water and areas worn down by other things such as wind or foot traffic. Ask, ***What are some other examples of erosion?*** Have participants give evidence that soil erosion happens (e.g., the way a river cuts into a bank, the way the Grand Canyon was formed, the way dirt gathers alongside a road).

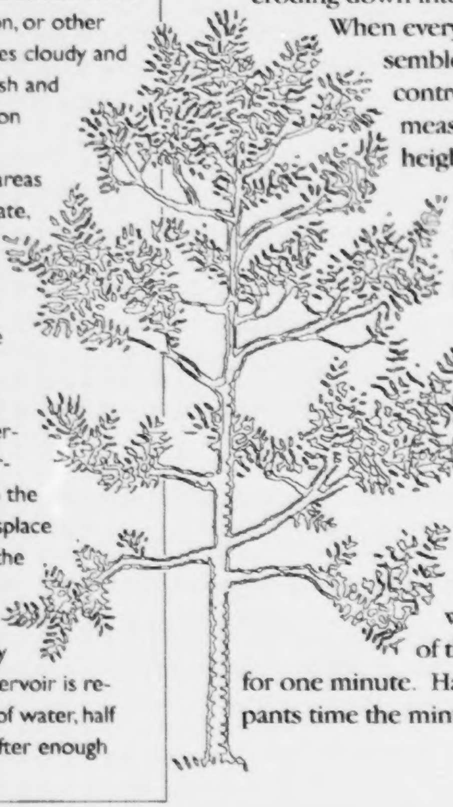
4. Break into small groups of three or four members. Each group is charged with researching a way to keep its mound of dirt from falling.

When is Soil Erosion a Problem?

- When topsoil erodes off a farm, important nutrients go with it, which makes the soil poorer in quality. When this happens it is necessary to add more fertilizers, which use more resources, cost more money, and are connected to other environmental problems.
- Super-rich fertilizer runoff creates algal blooms in water, which lowers dissolved oxygen in streams and harms a lot of aquatic life, including many insects, mollusks (e.g., oysters, clams, and snails) and fish.
- When soil erodes into a stream from agriculture, construction, or other sites, the water becomes cloudy and creates problems for fish and other life that depend on clear, clean water.
- Paved and/or treeless areas allow water to accelerate, which leads to more severe erosion, undercutting tree roots and filling in water drainage and/or intake pipes.
- When an area of land that feeds a dam is overgrazed or heavily deforested, soil eroding into the dam's reservoir will displace the water. Over time, the dam must release water when it rises too high, and ultimately the capacity of the reservoir is reduced (think of a cup of water, half full, which spills over after enough pebbles are added).

5. Give each group various materials to help them stop the erosion process, including: a third a box of toothpicks, a 10" X 10" piece of cardboard, a 10" X 10" piece of plastic (preferably tarp-like material), 5-10 tongue depressors, 25 feet of string, a roll of tape (any kind), scissors, and two handfuls of leaves and/or grass clippings. Feel free to add other items, as long as all groups have the same items.

6. Give groups a few minutes to discuss, and 20 or more minutes to create a means to stop the soil from eroding down into the pan. When everyone has assembled an erosion control system, measure the height of each mound to make sure that each mound begins at the same height. Then, walk around with a watering can and sprinkle water on each of their projects for one minute. Have participants time the minute.



7. Ask participants to measure the height of their mounds after the "rain," to measure the depth of the deepest amount of water outside of the mound, and to determine the "quality" of the water (by looking at its color).

Based on the following three criteria, have them determine which of the projects successfully contained the erosion best:

- Change in mound height and/or shape (the greater the change, the more erosion occurred).
- Amount of water escaping the mound (the more water escaping, the greater the likelihood for erosion).
- Quality of water escaping (the dirtier the water, the greater the evidence of erosion).

8. Encourage participants to think of other criteria as well (they should do this before the group has made a decision). Ask each group to guess why their experiments may or may not have worked. *Either way, what did they learn about soil erosion?*

9. Ask participants if they can think of other ways to control erosion. *What might slow water's flow? What might keep soil in place? How would planting a tree or a number or trees affect the movement of soil?*

Stop! Erosion!

ACTIVITY 31

For Younger Participants (Grades K-2):

1. Have participants observe water's flow, as in Step 3 above. Talk about where water goes and what water does to soil when it rains. Have them walk around the grounds to looking for signs of erosion.

2. When participants spot an eroded area, ask them to explain why they think it is eroded. Make sure to explain that soil erosion is normal, but sometimes it causes problems (see text box, p.196). *Is the area they pointed out a big problem? Why or why not? Are there any areas with severe erosion (where they can see a lot of uncovered roots, where plants have been torn out, where a nearby stream is full of dirt, etc.)?* Ask, *What can we do about this erosion?*

For Older Participants (Grades 9-12):

1. Challenge participants to think of different things water does when it falls to the ground. Discuss the reasons rainwater would be more likely to wash over the surface, rather than percolate into the ground water. *What speeds up this process? What slows it down?* Ask participants to define soil erosion. *How does erosion happen? When is soil erosion a problem?*

2. Take the group for a walk around the grounds and have them spot areas of erosion. If participants find examples of severe erosion (e.g., where roots are exposed, plants are ripped out, a lot of mulch is lost from planting areas, etc.), have them discuss what they could do to control the erosion. If there is no such area on their grounds, take them near an eroded stream bank (one where the roots of trees or other plants are severely undercut) or other area with erosion problems (for example, a construction site with ineffective or nonexistent erosion control barriers), and ask if there is anything that can be done to slow down or stop erosion.

3. Discuss the definition of Best Management Practice (see background). Have participants break into small groups and each come up with a plan to institute Best Management Practices on their grounds, near an eroded stream bank, or at a construction site. They may then create a model of their plan with soil, clay, and/or other objects (see "Making a Model Streambed" on p. 97 for ideas), and, if feasible, have them come up with a project to slow down erosion.

Project Ideas:

- Plant trees or other plants that will hold in the soil.
- Place liner logs around planting or habitat areas.
- Divert steep footpaths so that they switchback on themselves and reduce the incline, or place logs in the soil at intervals so that they hold in the soil (dug deep enough that a wheelchair can easily clear it, but not completely covered).
- Create terraced plantings on a steep slope.

Questions:

- Where does water go when it rains?
- What slows the path of rainwater?
- How can we prevent soil erosion?

Adaptations:

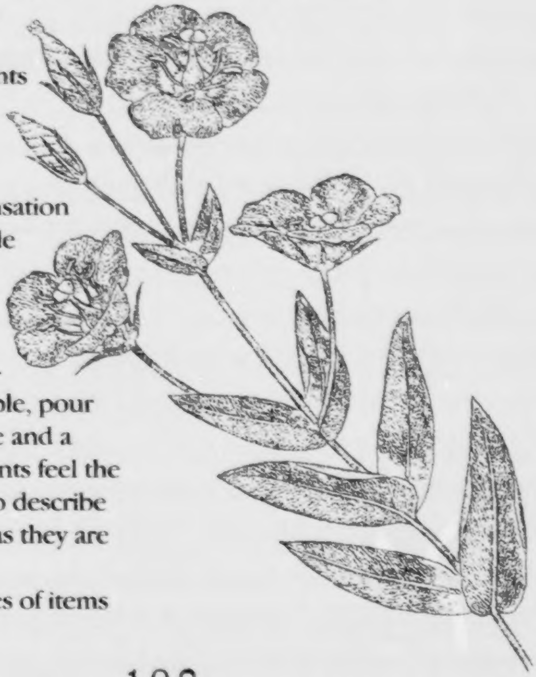
Refer to general adaptations on pages 11-16.

Hearing Disabilities:

- Use pictures (including one of the Grand Canyon if using that example) to illustrate erosion concepts. Use pictures to illustrate any of the BMPs you are discussing.
- If desired, create an interactive display to illustrate what happens to rainwater. Use a sponge (to represent soil) sitting in a pan of water to simulate percolation and ground water. If you have a hot plate or another way to heat water, you can create evaporation. Have participants hold their hand above the hot water so they can feel the humidity of the water molecules in the air. Make sure participants do not get close enough to the hot water to burn themselves. Simulate condensation by creating a cloud made out of fiberfill or loose cotton and dampening it. Squeeze this cloud to make "rain." To demonstrate the term **permeable**, pour water over a dry sponge and a rock and have participants feel the difference. Make sure to describe the processes in detail and work with the sign language interpreter.
- If possible, have samples of items that have been eroded such as smooth rocks or bricks for participants to touch. Give each participant a handful of soil to hold, and have them rub it in their hand to feel how easily it breaks apart.
- During the outside portion of the activity, have participants feel the eroded area to reinforce the concept.

Learning/Cognitive Disabilities:

- Use pictures (including one of the Grand Canyon if using that example) to illustrate erosion concepts. Use pictures to illustrate any of the BMPs you are discussing.
- If desired, create an interactive display to illustrate what happens to rainwater. Use a sponge (to represent soil) sitting in a pan of water to simulate percolation and ground water. If you have a hot plate or another way to heat water, you can create evaporation. Have participants hold their hand above the hot water so they can feel the humidity of the water molecules in the air. Make sure participants do not get close enough to the hot water to burn themselves. Simulate condensation by creating a cloud made out of fiberfill or loose cotton, dampening it, and then squeezing to make "rain." To demonstrate the term permeable, pour water over a dry sponge and a rock and have participants feel the difference. Make sure to describe the processes in detail as they are demonstrated.
- If possible, have samples of items that have been eroded such as smooth rocks or bricks for participants to touch. Give each participant a handful of soil to hold and have them rub it in their hand to feel how easily it breaks apart.
- During the outside portion of the activity, have participants feel the eroded area to reinforce the concept.
- If desired, give participants two examples of erosion control methods and allow them to choose which they would like to test.
- Have large rulers available for use. Participants who have difficulty using a ruler can measure their project with different colored strips of construction paper before and after the water is applied, comparing the strips to see the difference.



Stop! Erosion!

ACTIVITY 31

Motor Disabilities:

Overall:

- Select a largely accessible site for the outdoor portion of the activity.

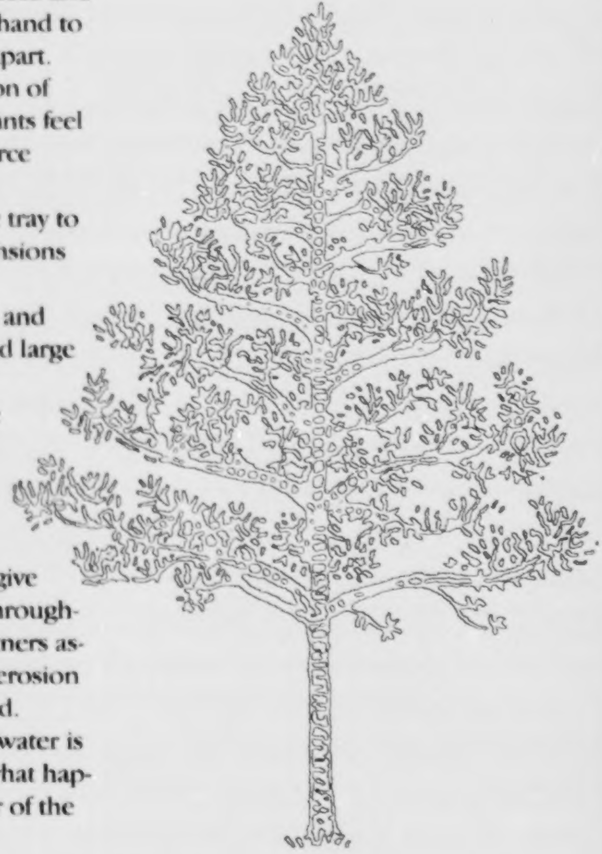
For participants with limited muscle strength, coordination, or dexterity of the hands:

- Have adaptive garden trowels available or build up the handles on spoons or trowels with tape, foam, or bandage material as needed for working with soil. You may also use ice cream scoops.
- For participants who have difficulty manipulating small items, use craft sticks instead of toothpicks. Have partners assist with assembly as needed.
- Have adaptive scissors and tape dispensers available as needed. Provide large rulers.

Visual Disabilities:

Overall:

- Create an interactive display to illustrate what happens to rainwater. Use a sponge (to represent soil) sitting in a pan of water to simulate percolation and ground water. If you have a hot plate or another way to heat water, you can create evaporation. Have participants hold their hand above the hot water so they can feel the humidity of the water molecules in the air. Make sure participants do not get close enough to the hot water to burn themselves. Simulate condensation by creating a cloud made out of fiberfill or loose cotton, dampening it, and then squeezing to make "rain." To demonstrate the term permeable, pour water over a dry sponge and a rock and have participants feel the difference. Make sure to describe the processes in detail as they are demonstrated.
- If possible, have samples of items that have been eroded such as smooth rocks or bricks for participants to touch. Give each participant a handful of soil to hold and have them rub it in their hand to feel how easily it breaks apart.
- During the outside portion of the activity, have participants feel the eroded area to reinforce the concept.
- Have participants feel the tray to get familiar with its dimensions before they begin.
- Have materials separated and labeled in both Braille and large print if possible.
- Have participants feel the finished product before and after the water is added to feel the differences.
- Have group participants give feedback and guidance throughout the activity. Have partners assist with assembly of the erosion control method as needed.
- Narrate the action as the water is added. Vividly describe what happens to the soil, the color of the water, etc.
- Have a talking timer available or have participants count out loud as the water is applied to their project.
- Have large print and Braille rulers available.



ACTIVITY
32

Deadly Links

Summary:

Participants play a game to learn about the effects of pesticides.

Grade Level:

2-7

Time:

30 to 45 minutes

Learning Objectives:

Participants will be able to:

- ◇ Define the term pesticide.
- ◇ Discover ways in which pesticides enter food chains.
- ◇ Describe possible consequences of pesticides entering food chains.
- ◇ Identify at least one alternative to pesticides.

Materials Needed:

- ◇ Food tokens: white and colored drinking straws, pipe cleaners, poker chips, or any other material that participants can easily pick up (30 pieces per participant in a proportion of 2/3 white and 1/3 colored)
- ◇ Three colors of bandannas, arm ties, labels, or other material to represent hawks, shrews, and grasshoppers

Background:

A food chain consists of different levels of energy consumption. Plants create food through **photosynthesis** by receiving the sun's energy, animals eat plants, predators eat those animals, and parasites and organisms help decompose dead or dying predators. A **food pyramid** connects related food chains together. A simple one may include a main predator (like humans) at the top, different prey eaten by the predator (cows, chickens) in the middle, and different plants (grasses, seeds) eaten by the prey at the base.

It is common practice for people to attempt to manipulate food chains with pesticides to control unwanted organisms. Herbicides control unwanted plants; insecticides control unwanted insects. Although pesticides are still widely used, alternative methods (e.g., planting diverse plant species to discourage a single pest from dominating, encouraging predators species to take care of insect pests, etc.) such as integrated pest management, native plant landscaping, and organic farming have helped reduce the use of pesticides on farmland and on homeowners' land.

An historical example of pesticide impact: At one time, U.S. farmers regularly applied a pesticide called DDT to their crops to reduce plant-eating insect populations. Biologists discovered that DDT accumulated up the food chain. Fish ate insects that were sprayed by the chemical; hawks, eagles, and pelicans ate the fish. Some of these birds accumulated DDT in high concentrations, and either became weak and died as a direct result, or suffered side effects. A common side effect—thinning eggshells—led to population declines in some bird species. The evidence of its damaging potential led to a ban of DDT in the U.S., and predator birds have begun an impressive recovery since then. Though the ban has accomplished a great deal, DDT and its byproducts remain in the system and may continue to impact the environment for some time.

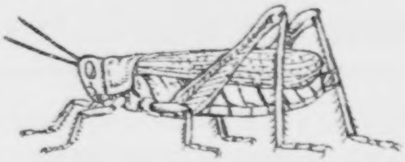
What to Do:

1. Discuss examples of food chains and how a food pyramid is formed. Ask , *Do you know what happens in a food pyramid? If a hawk eats 7 shrews, what does it have in its body?*

2. Divide the participants into three groups. In a group of 26 participants there would be 2 "hawks," 6 "shrews," and 18 "grasshoppers." Provide them with something that identifies which animal they represent (e.g., green arm ties for grasshoppers, red bandannas for hawks and brown arm ties for shrews).

3. Evenly distribute all the food tokens on the floor or ground of a large open space. Explain playing field boundaries to the group. Instruct the participants on the following rules:

- Each of the "animals" will have a chance to gather food. The grasshoppers are first to collect the food tokens that represent corn or other plants. They can pick up the food tokens for 30 seconds. The grasshoppers will want to move quickly to gather as much food as they can. Meanwhile, the hawks and shrews sit quietly on the sidelines watching the grasshoppers.
- After 30 seconds, the shrews begin to hunt the grasshoppers by taking them by the arm. Each shrew should have time to catch one or more of the grasshoppers. Any grasshopper caught by a shrew must give its food tokens to the shrew and then sit on the side lines. The hawks continue to watch from the sidelines.
- For the next (approximately) 30 seconds, the hawks hunt for food. Shrews may keep hunting for grasshoppers; any free grasshoppers may continue to gather the food tokens; and the hawks swoop into the picture, hunting for shrews. If a hawk catches a shrew, the hawk gets the shrew's food and the shrew goes to the sidelines.



4. At the end of the designated time period, ask all the participants to come together in a circle with all the food they collected. Hawks and any remaining shrews and grasshoppers should count the number of white and multi-colored food tokens they have gathered.

5. Inform participants that there is something called a pesticide in the environment. A farmer sprayed the pesticide onto the crop the grasshoppers were eating in order to prevent a lot of damage by the grasshoppers. This pesticide is poisonous, accumulates in food chains, and stays in the environment for a long time. In this case, all multi-colored food tokens represent the pesticide. If any of the remaining grasshoppers have multi-colored food tokens, they are now dead. If any shrew's food supply is more than half multi-colored pieces, it is also dead. Players whose animals are dead should move to one side of the room. The hawk with the highest number of multi-colored food pieces will not die right away; however, it has accumulated a lot of pesticides in its body. The eggs it produces during the next nesting season will be have shells so thin that the eggs will not be able to hatch successfully. The poison does not visibly affect the other hawk at this time.

6. Discuss what the group just experienced in the activity. Ask them to look at how many animals were affected by the pesticides. What observations can they make about how the food chain seems to work, and how toxic substances can enter the food chain. The participants may be able to give examples of animals affected by the pesticides in this activity beyond those of the grasshopper —-shrew—hawk food chain. Ask, *What could farmers use instead of pesticides?* Guide the group to think about the use of natural insect predators or crop mixing as alternatives.

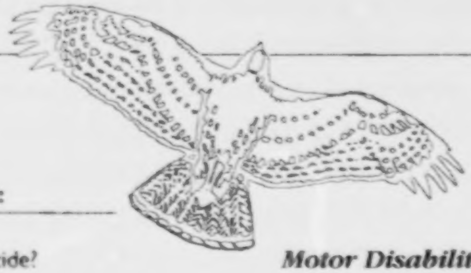
7. If time allows, repeat the activity and rotate the participants and animals they represent.

For Older Participants (Grades 8 and Up):

Have participants create their own version of this game, with new animals they may know about in the local area that have suffered from pesticides or other pollution-related problems. They should think about: 1) The animals that are involved; 2) Relationships in the food chain these animals should represent; and 3) Pollution issues important to these animals. Participants can present their new game to younger participants and lead them in playing it.

ACTIVITY
32

Deadly Links



Questions:

- What is a pesticide?
- What effects do pesticides have on animals in a food chain?
- What could farmers use instead?

Adaptations:

Refer to general adaptations on pages 11-16.

Hearing Disabilities:
- Use pictures/drawings to illustrate food chains/ food pyramids.
- Demonstrate each step of the game as you explain it.
- Use a visual display timer during the game.
- Use a signal such as a flag to show when time is up.

Learning/Cognitive Disabilities:
- Use pictures and drawings, or create a poster to illustrate food chains and food pyramids.
- Demonstrate each step of the game a you explain it.
- Prepare signs with the name and picture of the creature for each participant to wear.
- Use a timer that participants can see and hear during the game.
- Use a whistle to signal the end of rounds.
- Narrate the game to decrease confusion as needed.
- Adjust the length of the rounds as needed.
- Have all participants do a quick walk instead of running.

Motor Disabilities:
Overall:
- Choose a level, accessible site for the game, such as a gym or blacktop.
- Encourage the use of any adaptive equipment such as reachers to pick up items.
- If you wish, use a large tabletop or group of tabletops for the gathering part of the game.
- Pair up participants as needed. Encourage partners to actively engage the participants in the game and to not do everything f or them.
- Use large objects or objects with handles for "food" as needed.
- Give participants a bag with handles to place their "food" in as needed.
- Adjust the length of the rounds as needed.
- Have all participants do a quick walk instead of running.

Visual Disabilities:
Overall:
- Choose a level site for the game, such as a gym or blacktop.
- Use a timer that participants can hear.
- Prepare large print signs with the name and picture of the creature for each participant to wear. Label in Braille.
- Give participants a bag with handles to place their "food" in.
- Use larger objects for "food."
- Pair up participants as needed. Encourage partners to actively engage the participants in the game and to not do everything for them.
- Have players identify themselves before "capturing" participants with visual disabilities. Allow the "captured" participants to take the arms of the "hunters".
- Narrate the game to decrease confusion as needed.
- Adjust the length of the rounds as needed.
- Have all participants do a quick walk instead of running.

For participants with low vision:
- Use large objects such as blocks for "food." Each object should be one of two bright colors. Put a piece of white or yellow paper under each object if the contrast with the natural environment is not enough.

For participants who are blind:
- Place hula-hoops around "food" to help participants locate it. Make these items off limits for other participants.

© 1983, 1985, 1992 Council for Environmental Education. Adapted with permission from Project WILD K-12 Activity Guide. The complete Activity Guide can be obtained by attending a Project WILD workshop. For more information, contact the Michigan Project WILD Office at (517) 355-1712.

Habitat Shrink

ACTIVITY 33

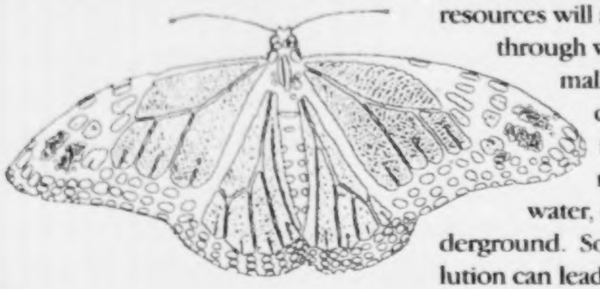
Background:

Habitat loss due to human development is the most widespread threat to **endangered species**, those species that are in danger of becoming extinct. It is, therefore, the biggest concern when considering the loss of biodiversity in most areas. **Biodiversity**, the great variety of living things, is important to the health of an ecosystem. The greater the variety of plants and animals in an area, the more likely the system will recover in the face of a large-scale calamity (e.g., fires, disease, flooding). Also, about one-fourth of all prescription drugs produced today contain active ingredients that were originally found only in certain plants. The fewer plant varieties from which to choose, the fewer opportunities we may have to fight diseases.

Habitat loss attributed to humans includes the removal of trees for timber, farming, grazing livestock, and residential and/or industrial development. Strip-mining for various minerals also clears large tracts of land. In addition, roads built through an area of habitat interrupt animal migration patterns as they search for basic needs. Also, plant removal and the addition of paved surfaces both contribute to erosion and the increased flow of sediments and toxins into the water supply.

Other development plans, such as large water projects (e.g., canals), often call for people to drain and/or fill in wetlands. This can have a huge negative impact, as wetlands are habitat for a wide variety of animals, they act as an important filter for toxins, and form a natural sponge that holds in a tremendous amount of water.

Another habitat loss issue is overgrazing of cattle and other livestock. Cattle that stay in one place for an extended period of time will eat the plant life to death. Without plants to hold in the soil, topsoil runs off into streams, taking habitat from plant and animal populations found in meadows as well as in streams. Finally, depletion of the water supply and pollution of water resources will affect all habitats through which the water normally flows. This includes surface water, such as lakes and rivers, and ground water, or water found underground. Some forms of air pollution can lead to acid rain, which in turn can adversely affect soils and



Summary:

Participants play a game demonstrating the effects of habitat loss on animal populations.

Grade Level:

1-6

Time:

45 minutes

Learning Objectives:

Participants will be able to:

- ◇ Define the terms endangered species and habitat loss.
- ◇ Discuss different types of habitat loss and how they affect wildlife.
- ◇ Discover what happens to an animal population when it experiences habitat loss.

Materials Needed:

- ◇ Chalk or other material to mark off the "habitat area"
- ◇ Red and blue squares of paper to represent food and water
- ◇ Paper and pencil to record the results each round

plant life far away from the original source of pollution.

What to Do:

1. Ask participants, *What are some of the greatest challenges facing endangered species today?* Discuss some answers and note that habitat destruction is one of the largest problems. Explain to the group that they will have a chance to see this challenge in action. They have all been transformed into "mountain lions," and are confined to a certain space nearby. In this space, from now on referred to as their habitat, the "mountain lions" must find all their food and water.

2. Designate a space large enough so that all the participants can move around in it with some comfort. There are many ways to mark off the boundary of this "mountain lion habitat," including drawing a shape with chalk on blacktop, using easy-to-remove colored tape on a gymnasium floor, or using a long piece of thin rope or string tied into a large loop. Explain that normally, mountain lions are shy and solitary animals, and depending on food availability, a male may cover a territory of hundreds of square miles. Participants should imagine that their small space represents many hundreds of square miles.

3. Once the whole group has entered the space, tell them that to survive, they must find enough food and water. Small blue squares of paper represent water, and small red squares represent food. Label each square in case anyone has difficulty seeing colors. Place enough squares throughout the area so that each participant can collect at least four water (blue) squares and two food (red) squares. Tell them that in the next two minutes, they must get at least four pieces of blue paper, and two pieces of red, without running into each other. Look at Figure 1, below to get an idea about space and numbers.

FIGURE 1

Number in group	Approx. Space at Start (in Sq. Ft.)	Amount of Food (Red Squares)	Amount of Water (Blue Squares)
10 or less	30	20	40
15	45	30	60
20	60	40	80
25 or more	75	50	100

4. Since mountain lions are very territorial, especially males, they will not tolerate close quarters. If they bump into each other, one must leave the habitat area. Tell each of the offending "mountain lions" to play rock, paper, scissors, or flip a coin, to determine which participant stays and which one must step out of the habitat.

5. Set a stopwatch and let participants hunt for water and food. If anyone loses a confrontation or, at the end of the two minutes, does not have enough food or water, they must step out of the habitat area. Those without enough water or food at the end of the period have "died" of thirst or hunger. Have the group count the number of "mountain lions" inside the habitat area, and those standing outside the habitat area. They should record these numbers each round, so they can compare them at the end of the game. Have them return their food and water squares for the next round. Unless it is specified otherwise, each round should start with the same amount of food and water squares in the habitat.

6. For the second round, tell the group that the area has been repopulated with the same number of "mountain lions," so everyone is back in the activity. This round, however, a rancher has cleared a section of the land to graze cattle, so mark off a fourth of the habitat to indicate the rancher's land. The grasses growing there attract deer, so the food should still be spread evenly across the whole habitat, including the rancher's new section. Players, however, may not enter the new grazing land. Otherwise, they should continue to search for food and water as in the first round. Have them go for another two minutes, and have them record the results at the end of the period.

7. For the third round, tell participants that an interstate has been routed through part of the habitat. Mark off a relatively thin strip through the middle of the habitat. Disperse food throughout, even on the road, as deer venture out at the forest edge to graze. Mountain lions cannot cross the road, or they will be hit by oncoming traffic. The other rules from the first round and second round are still in effect. Run the game again and record results.

8. For the fourth round, tell participants that nearby towns grow and put in shopping centers off the interstate, taking another corner of the available habitat. Ground water use increases, and very few prey animals venture into the parking lots of shopping centers. Mark off another fourth of the habitat that mountain lions cannot use. Place only half the number of water (blue) squares throughout the rest of the habitat for this round. Place food (red) squares only outside the shopping area. Play this round as the others, with the addition of the shopping centers.

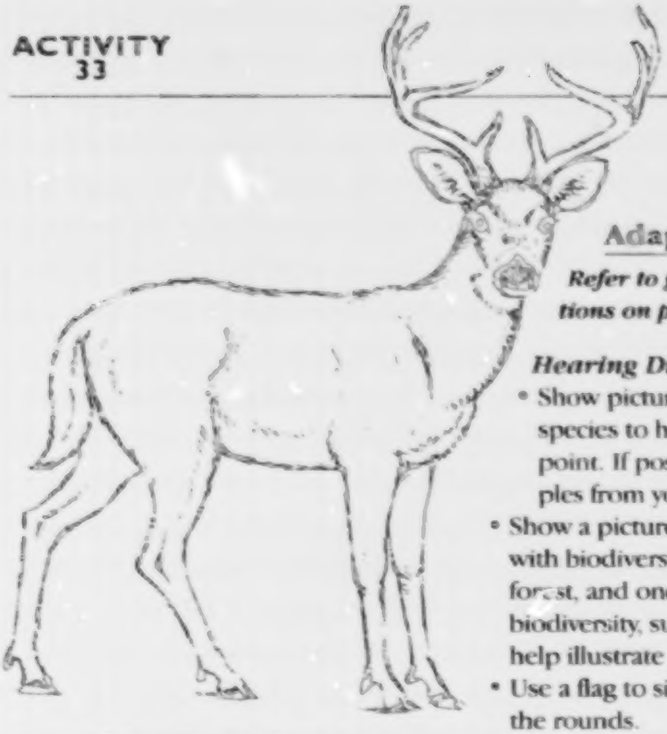
9. The rounds can continue with other impacts, including pesticides and/or sewage contaminating water sources, suburban sprawl limiting the amount of space mountain lions can use, and so on. Consider using species and/or types of human impacts in the activity that are representative of your region. For example:

- Some housing developments in New Jersey and other states have pushed into black bear territory; both humans and bears have suffered some ill effects as a result (bears guilty of foraging in residential garbage or attacks on pets are either relocated or, occasionally, shot by state wildlife officials).
- In the Pacific Northwest, salmon have suffered population declines due to changes in their waterways (large dams have made it difficult for some salmon to find their spawning pools; silt from deforestation has run into streams in some areas, incredibly reducing water quality).
- Golden-cheeked warblers, which spend their summers in a small region in central Texas, are experiencing declines due to fragmentation of the juniper and oak woodlands upon which they depend for nesting and food.

10. When finished, talk to the group about what happened. Look at the data collected from each round. Ask the group, ***Did the numbers of lost mountain lions change each time different parts of the habitat disappeared?*** Discuss how each change would affect their other needs of finding cover and a safe place to raise their young. Ask, ***How in each instance people can make a positive difference for predators, and why this would be a good idea?*** Make a list of these ideas on a flipchart or board.

ACTIVITY
33

Habitat Shrink



For Older Participants (Grades 7 and Up):

Have participants gather in small groups to come up with additional impacts for Step 9 above. Ask, *What other human actions cause habitat destruction?* Make a list on a board or flipchart. *In this area, what actions have the most impact? What animals are/will be most affected?* Have participants try to come up with solutions for each of the actions they listed.

Questions:

- What is habitat destruction?
- What happens to animals when their habitat is destroyed?
- How can we make a difference?

Adaptations:

Refer to general adaptations on pages 11-16.

Hearing Disabilities:

- Show pictures of endangered species to help illustrate your point. If possible, use examples from your region.
- Show a picture of an area rich with biodiversity, such as a rainforest, and one with very little biodiversity, such as a lawn, to help illustrate your point.
- Use a flag to signal the end of the rounds.
- Use a different colored tape, chalk, or string to mark off areas where participants cannot go as the rounds progress.
- Keep track of the rounds on a board or sheet of butcher paper to help participants track the game.

Learning/Cognitive Disabilities:

- Show pictures of endangered species to help illustrate your point. If possible, use examples from your region.
- Show a picture of an area rich with biodiversity, such as a rainforest, and one with very little biodiversity, such as a lawn, to help illustrate your point.
- Show a picture of a mountain lion to help participants visualize what animal they will be in the game.
- Use larger pieces of colored paper with pictures of water (e.g., a wave or a glass of water) and food (e.g., an apple or a drumstick) on them for participants who have difficulty reading.
- Reduce the number of food and water tokens that participants must collect as needed.
- Provide collection bags with handles.
- Narrate the rounds as needed to help keep participants informed.
- Use a whistle to signal the end of the rounds.
- Use a different colored tape, chalk, or string to mark off areas where participants cannot go as the rounds progress.
- Simplify the rules for each round and/or decrease the number of rounds as needed.
- Keep track of the rounds on a board /sheet of butcher paper to help participants track the game.
- Extend the time of the rounds as needed.

Motor Disabilities:
Overall:

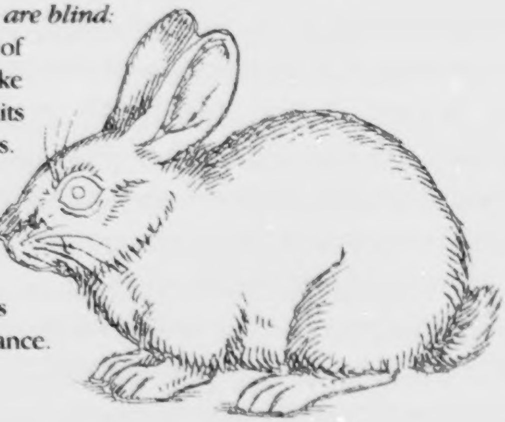
- Choose a level, accessible site for the game, such as a gym or blacktop.
- Pair up participants as needed. Encourage partners to actively engage the participants in the game and to not do everything for them.
- Instead of pieces of paper, use blue sponges to represent water and pink or yellow sponges to represent food.
- Encourage participants who have reachers to use them to pick up

items during the game.
- Provide collection bags with handles.
- Reduce the number of food and water tokens that participants must collect as needed. An alternative is to place some of the tokens inside of hula-hoops and make these tokens off-limits to other participants.
- Extend the time of the rounds as needed.

Visual Disabilities:
Overall:
- Have a box filled with a variety of items with different shapes and textures (e.g., different leaves, grasses, acorns, etc.) for participants to explore to illustrate biodiversity. Then have a box filled with just one type of leaf or grass for participants to explore and compare it to.
- If possible, have a nature sounds tape with a mountain lion on it for participants to listen to before playing the game.
- Assign partners to those participants who need assistance. Have the partners verbally lead them through the game, assisting with finding the required tokens, etc. Encourage the partners to describe the action that is going on in the game.
- Choose a level site for the game, such as a gym or blacktop.
- Use a guide rope to mark of the playing area.
- Each time you shrink the area or mark off areas where participants cannot go, allow participants to explore these new dimensions and get their bearings before starting the round.
- Use colored sponges as food/water tokens.
- Reduce the number of food and water tokens that participants must collect as needed.

For participants with low vision:
- Place the water tokens on top of pieces of white paper and the food tokens on top of pieces of yellow paper on the playing surface to provide contrast. Make these tokens off-limits for other participants.
- Provide collection bags with handles.
- Narrate the rounds as needed to help keep participants informed.
- Use a whistle to signal the end of the rounds.
- Extend the time of the rounds as needed.

For participants who are blind:
- Place tokens inside of hula-hoops and make these tokens off-limits to other participants. Participants who use canes will be able to feel the hula-hoops and then find the tokens with minimal assistance.



ACTIVITY 34

What to Do With an Empty Lot

Summary:

Participants take part in a role play simulation to determine the use of vacant land.

Grade Level:

4-8

Time:

1 hour 30 minutes

Learning Objectives:

Participants will be able to:

- ◇ Develop an understanding of land-use issues through role-play.
- ◇ Take on the role of a stakeholder in an environmental issue.
- ◇ Experience the difficulty of making decisions about complex issues.
- ◇ Observe the ways one decision can affect the environment, people, the economy and financial interests of many people.

Materials Needed:

- ◇ Pencils and paper
- ◇ Copies of the Role-Play Activity Sheets
- ◇ Copies of the Empty Lot Map

For younger participants (K-3), include:

- ◇ Butcher paper
- ◇ Construction paper
- ◇ Scissors
- ◇ Tape or thumbtacks
- ◇ Tempera paints and brushes
- ◇ Crayons, markers, or colored pencils
- ◇ Objects such as film canisters, craft sticks, cotton balls, etc. (optional)
- ◇ Photos from old magazines or newspapers

Background:

Open space is a valuable asset to any community. Not only does it provide aesthetic beauty for us; it can also serve as a home for a wide variety of organisms. Land has economic value, too, and as owners in cities develop their land, open space often disappears.

Landowners must pay a variety of taxes and fees for their land, and any maintenance adds to their expenses. Many opt to develop their land as a way to cover their costs. Frequently, people sell their land after property values have risen. This is a common way to make a profit in our economy. This role-play activity presents a simplified version of these everyday occurrences, as property owners make decisions about what to do with their land.

What to Do:

1. Ask, *What would you do if you had a piece of land and all your friends wanted to use it in different ways?* Explain that participants will be taking on the roles of various groups involved in deciding what to do with a vacant lot.

2. Divide participants into six groups. Distribute handouts. The first handout is a map of an open space in town. Explain that the space is about the size of one football field, and has a natural stream running along one edge of it. The owners of the lot have been approached by different groups which have expressed interest in using the land. There will be a meeting where each group will have to present their proposal to the owners. Each group will take on the role of one of these groups.

What to Do With an Empty Lot

ACTIVITY 34

3. Using the role-play handouts provided, assign roles to groups. If possible, assign a volunteer to help guide each group.

4. Give each group the appropriate worksheet and at least 15 minutes to meet, read, discuss their point of view, and create a strategy for convincing the owners of their view. Have them write their points on the worksheets so that they have a written strategy to present to the class.

At some point while small groups are discussing options, discuss with the Conglomerate group the fact that their company has been cited for illegally dumping chemical waste in the past. None of the other groups know this. Tell the group they can decide whether they want to inform the owners about this or not. If they do not make the announcement themselves, inform them that at some point, you (the instructor) will act as "whistle blower" and inform the owners of this fact.

5. While the rest of the groups are developing their strategies, have the Owners group do the math questions. They should also develop the criteria they will use for making their decision, before they hear the other groups' proposals. Tell them that they must pay attention to all the proposals, avoid making judgements before they have heard all groups, and that they must vote at the end of the period on the plan they will accept for their land. They will be able to choose only one of the options presented.

6. When all groups are ready, have them take turns presenting their case to the owners. At the start of each presentation, have the group write its name on the blackboard. Give each group five minutes to present its proposal.

7. After all the presentations have been made, allow the owners 10-15 minutes to reach a decision. During this time, have each participant from the other groups write down what he or she thinks should be done with the land, and whether this differs from the views of the group he or she was in. When the owners have reached their decision, they should tell the group what they decided to do and why they made the decision the way they did.

8. Lead a discussion about the way the participants felt when they presented their cases, and the way they felt when their proposals were or were not selected. Discuss how one decision can affect the environment, the people, and the economy and financial interests of many people at the same time. *Are there any land use issues currently in the news in your neighborhood? What are they? What opinions do you have about these issues?*

For Younger Participants (Grades K-3):

1. Introduce the activity by explaining the situation with the empty lot. Show them the map of the empty lot and explain that it is about the size of a football field and has a natural stream running along one edge. Tell them that different groups would like to use the land for different things.

2. Break the participants into the different groups. Use less complex and detailed group names, such as the Owners, the Gardeners, the Animals (replaces environmentalists), the Park, the Office Building, and the Shopping Mall. Give each group a copy of the map or post it in a place everyone can see.

3. Tell each group they are going to draw or create a model of what they want to do with the lot. Make sure all the groups (except the Owners) understand that they are pretending to be whatever their name is. For example, if they are the Shopping Mall, they need to draw or build a shopping mall. They also need to either include the features on the original map, like the stream, or explain what they did with them.

4. Have the Owners also draw what they want to happen in their space. Remind them that they can use this land to make money. They can choose from the other group ideas or come up with their own. They must also include the features of the map. Have each group (except the Owners) show their model and explain different pieces. Have the Owners show their model, then tell them which one of the others they would choose. *Why? Was it different than what they drew/built?*

5. After all groups have had a turn to explain their artwork, lead a discussion about how the groups felt when their drawing was or was not selected.

For Older Participants (Grades 9-12):

After playing this game, you may want to encourage participants to research a local issue and create their own role playing game. Bring in current newspapers and magazines for ideas. The group should decide as a whole what issue they want to address and then divide up in groups to write the descriptions for the individual interest groups involved. Then have the group present their game to another group and lead it. *What do they discover?*

Questions:

- What would you do with an empty piece of land?
- What kinds of factors do you need to balance?
- How do you evaluate which ones are best for your community?

Adaptations:

Refer to general adaptations on pages 11-16.

Hearing Disabilities:

- Briefly discuss each group and give real world examples of each.
- Have the sign language interpreter check-in with all the groups that have participants with hearing disabilities. If possible, have additional interpreters for this activity.
- Encourage participants to voice their opinions and/or write notes to other group members in the role play/larger discussion groups.
- Allow participants who have difficulty speaking to use the sign language interpreter to give their presentations to the group.
- Have the volunteer guide the group as needed.

Learning/Cognitive Disabilities:

- Briefly discuss each group and give real world examples of each.
- Encourage participants to voice their opinions in the role play/larger discussion groups.
- Have a volunteer guide the group as needed.
- Have a member of the group read the role-play slip aloud and one member act as the group secretary for participants who have difficulty reading and/or writing.
- Have participants wear name tags with the name and a picture of the groups they represent as needed.
- Provide a calculator for use as needed.
- Have participants make a 3-dimensional map using items such as craft sticks and clay to make a less abstract representation of their development plan.
- If appropriate, have participants complete the younger participant version of this activity.

Motor Disabilities:
For participants with limited muscle strength, coordination, or dexterity of the hands:

- Adjust height and angle of work surface as needed.
- Build up pencils with tape, putty, or adhesive bandage material as needed.
- Have adaptive scissors and glue

What to Do With an Empty Lot

ACTIVITY 34

sticks available (younger participant version).

Visual Disabilities:

Overall:

- Provide a large map with things labeled in Braille and large print. Outline all map lines and elements in thick, raised lines of glue. It may be necessary to break map into separate sections (on separate pages).
- Have role play activity sheets in Braille and large print.
- Have the volunteer guide the group as needed.
- Encourage participants to be active in the group discussion and express their opinions.
- Have participants make a 3-dimensional map using items such as craft sticks and clay instead of completing a drawing.

For participants with low vision:

- Provide a variety of magnifiers.
- Consider individual lighting needs.
- Provide drawing paper, thick black markers, and a clipboard for participants to use.

For participants who are blind:

- Have a Braille calculator available if possible.

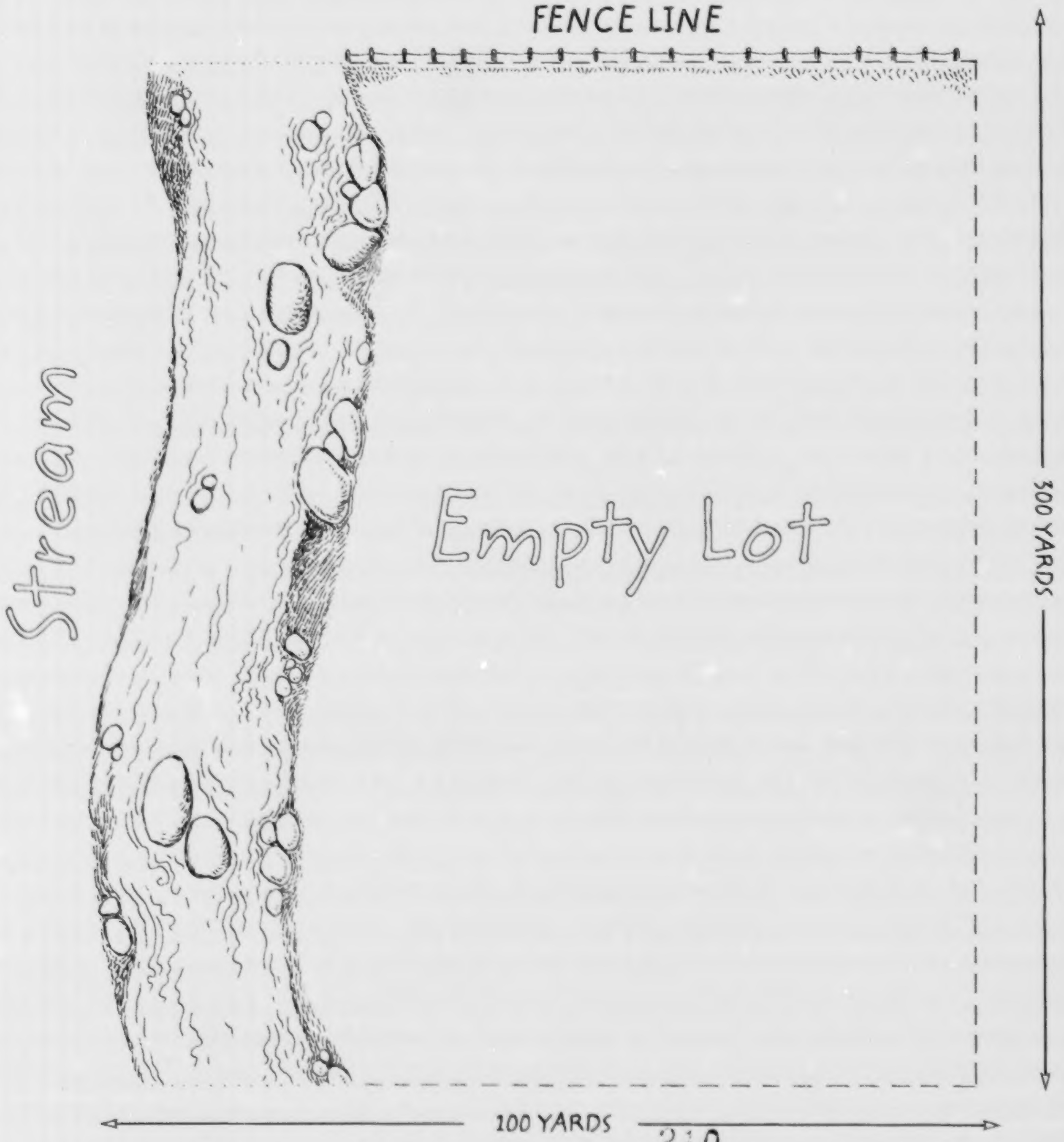
For K-3 version:

- See first adaptation in the "*Overall*" section for large map directions.
- Have cardboard cut-outs of different items such as the mall, the office building, etc. for participants to create their presentation. Have large print and Braille labels available for participants to use, or a Braille labeler.

WORKSHEET

Map of Empty Lot

DIRECTIONS: Using this map, decide how your group will develop the land.


FENCE LINE
Stream
Empty Lot
300 YARDS
100 YARDS

Role Play Activity Sheets

WORKSHEET

Owners

You are the owners of an empty lot in the center of town. Many different groups wish to use your property for their own purposes. You must make a decision about what you will do with your property. As owners, you pay property taxes of $250.00 per year. You have owned the property for ten years. You bought the land from the town for $5,000 ten years ago. The value of the lot today is $10,000. Write the total amount you have paid for this lot on the line below:

$250.00 per year X 10 years ____________________

Original purchase price ____________________

TOTAL expenditure for lot ____________________

Current value of the lot ____________________

You have asked all the groups interested in your land to attend a meeting to explain how each wants to use your land. Your group must then make a decision about what to do with the land. List three criteria you will use to make your decision:

Gardeners' Group

You are members of the local gardening group who want to use the land to grow fresh vegetables. The money you earn will start a Student Gardening Corps, where participants learn gardening skills and help run the garden. You also want to give vegetables to the soup kitchen to feed homeless people. You are a non-profit organization, but you are willing to pay the owners $250.00 per year to rent the land. (This happens to be the same amount that the owners pay in property tax.)

What is the name of your organization?

List three reasons your group should have the lot. (You will present these reasons to the owners.)

1.

2.

3.

BEST COPY AVAILABLE

How will the owners benefit from your proposal?

Role Play Activity Sheets

Parents' Group

You think the lot should be made into a park. The native vegetation should be cleared and replaced with grass so children can run freely. Playgrounds and picnic tables will be installed. This park would be closer to many people who have to travel a long way to get to another park. Your group asked the city to purchase the land for the park, and the city has said it would buy back the land for the price it was sold for ten years ago: $5,000.00. However, the land is now worth $10,000.00.

What is the name of your organization?

List three reasons your group should have the lot. (You will present these reasons to the owners.)

1.
2.
3.

How will the owners benefit from your proposal?

Environmentalists

Your group believes the lot should be left as open space. The lot has been wild for ten years and is the largest piece of open space in town. It's home to several species of birds, small mammals and insects. The stream has fish, frogs and turtles; the land has some native plants growing on it. Your group does not have any money to buy the lot, nor do you want to own it.

What is the name of your organization?

List three reasons your group should have the lot. (You will present these reasons to the owners.)

1.
2.
3.

How will the owners benefit from your proposal? What can you propose in terms of management, if you don't want to own the lot yourselves?

Role Play Activity Sheets

WORKSHEET

Conglomerate Construction

Your company wants to buy the lot to build a mini-mall that will have a video store, a dry cleaner, a pinball arcade and a photo lab. The mall will create 50 local jobs, so it has an important economic value. Your company has been cited for environmental violations in the past for dumping chemicals into local creeks. You still dump chemicals secretly and pay the fines when you are caught. Your company has a lot of money, and could make a lot of money on the mall and provide a lot of business to the community. You offer the owners $20,000.00 for their lot, which is twice the present value of the property.

List three reasons your group should have the lot. (You will present three reasons to the owners.)

1.

2.

3.

How will the owners benefit from your proposal?

Office Building Developers

Your group would like to buy the lot and build an office building for your growing company. The building would provide 100 new jobs, so it has economic value. Your company is willing to pay the owners the present property value of $10,000.00 for the lot.

What is the name of your organization?

List three reasons your group should have the lot. (You will present these reasons to the owners.)

1.

2.

3.

BEST COPY AVAILABLE

How will the owners benefit from your proposal?

ACTIVITY
35

Career Day

Summary:

Participants explore different environmental-related careers through role playing.

Grade Level:
4-8

Time:
1 hour

Learning Objectives:
Participants will be able to:

- ◇ Role play an environmental-related career.
- ◇ Describe the duties of at least six different environmental-related careers.

Materials Needed:

- ◇ Index cards
- ◇ Pens, pencils
- ◇ "Career supplies" for at least six different jobs (see Career Cards)

Background:

By dressing up to act the part of someone who works in an environmental field, participants will amuse themselves while learning how different real-life careers are related to the environmental topics they have been studying. For example, if participants enjoyed searching for different kinds of flowers in the activity "Flower Hunt," they might be excited to play the part of a botanist, all decked out in overalls and gardening gloves. The same participants might also be interested in playing the part of a natural landscaper. Others who had fun studying wildlife in the "Local Wildlife" activity, might be interested in playing the part of a zookeeper or a field biologist.

Below are some examples of people who work to study, and conserve the natural world, but this is by no means a comprehensive list. More examples are found in the following activity, "Ask the Expert," though there are many more careers out there. Encourage participants to be creative!

Field Biologists include zoologists (who study animals) and botanists (who study plants), mycologists (who study fungi), and others. All of the areas of study have a huge number of categories within them (for example, some zoologists study insects, others study birds, mammals, or reptiles). There is also a lot of variety within categories. There are general things that field biologists do, for example, such as identifying different species, how a species fit into their environment, measuring the size of a specimen (length, width, and weight if possible), describing small details, and sometimes assessing the health of a specimen. Field biologists on land might wear hiking boots, a hat, long pants, and a long-sleeved shirt to avoid insect bites. They might carry bug spray, a field guide, a notebook, and binoculars. Some might bring climbing equipment to search high up in trees, and still others may wear scuba gear to investigate ocean life. For role-playing, be specific on the area of study for biologists and select the appropriate equipment.

Environmental Educators and Naturalists include classroom teachers who focus on environmental issues or nature study, and naturalists from a park or a conservatory. They may have teaching tools such as chalk, books, posters, and artifacts such as animal skulls, flowers, or interesting rocks.

Environmental Scientists include those who study air, water, and/or soil quality. Some may specialize in very specific problems, such as toxins in a particular river, and some may study aspects of large-scale environmental problems, such as global warming. Environmental sci-

Career Day

entists may work in a laboratory, and so may wear a white lab coat, rubber gloves, and eye-protecting goggles. They often give presentations on their findings and may also wear business suits.

Park Rangers include those who protect wildlife from illegal hunting and fishing and issue hunting and fishing permits, those who investigate environmental crimes, and those who enforce other park regulations (closing times, camping regulations, etc.). Park rangers often serve as interpretive guides, and present natural or human history in conjunction with their park. Rangers almost always wear some kind of uniform and a badge. Federal park rangers (e.g., National Park Service, U.S. Forest Service, U.S. Fish and Wildlife Service) usually wear a standard earth-toned (e.g., gray, green, or brown) uniform with a large brimmed hat, often have radios on their belts and may carry clipboards or binoculars. Different states have different uniforms, though many states have similar earth-toned uniforms.

Veterinarians take care of animals when they are sick or injured. Much like human doctors, they go to veterinary medical school and work with other veterinarians to prepare themselves for their medical careers. Vets may specialize in working with pets or with exotic animals. They may work in local animal hospitals or in zoos. Many zoos have entire medical centers for their animals. Vets may wear white doctor coats and face masks, and carry stethoscopes or syringes to care for their animals.

Natural Landscape Designers develop plans for landscapes at private homes, office buildings, schoolyards, etc. Their focus is to create landscapes that blend in with the natural environment and so attract more wildlife and require less maintenance. These designers may be found with a shovel, overalls, heavy gloves, and a clipboard with some plans clipped to them.

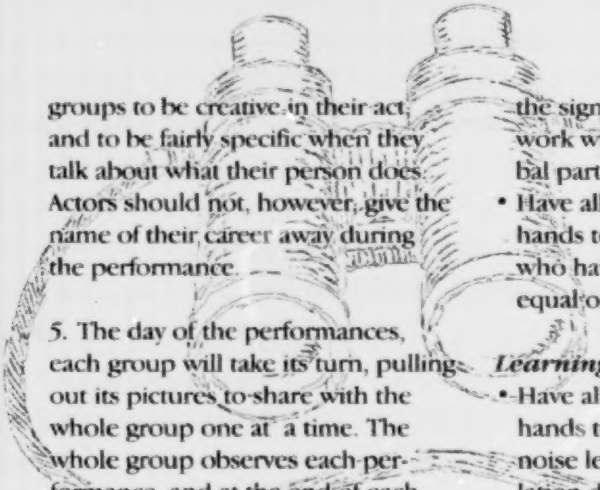
What to Do:

1. Some of the participants in this activity will have the opportunity to role-play an environmental-related career, while others will have a chance to try to guess which career is being represented. Younger participants will need the instructorto prepare materials and information on these different careers ahead of time. Older participants (5th grade and up) will likely bea ble to do their own research on different careers.

2. Prior to this activity, ask participants, ***What environmental-related careers can you think of? If you want to help save wildlife, what kinds of jobs could you have?*** Make a list on a board or flipchart. Discuss each one, talking about what they do for a living, what skills or education they might need, what they might wear to work, or what kind of equipment they need to do their jobs, etc.

3. Ask for about six volunteers to act out wildlife careers. Divide up the rest of the participants into six groups to assist each of the volunteers. Alternatively, have the whole group act out each career.

4. Tell the six groups that the next time they meet, one member (or more) will have the opportunity to dress up and act like a person with an environmental-related job. Give each group the relevant card (provided at the end of the activity), and have each group draw the different aspects of the career on index cards or larger pieces of paper to share during their performance. For example, the veterinary group could draw a couple of the animals they may work on, a stethoscope, a doctor's coat, syringe, perhaps a bottle of medicine, and so on. Older participants (5th grade and up) can do more research on the career themselves, to add more information than given on the card. If feasible, encourage participants to try to find and bring in the kinds of clothing items and props their actor will need for their performance. These items should be brought in the day of the performances. If finding these props is impractical, using the drawings alone should be sufficient. Tell



groups to be creative in their act, and to be fairly specific when they talk about what their person does. Actors should not, however, give the name of their career away during the performance.

5. The day of the performances, each group will take its turn, pulling out its pictures to share with the whole group one at a time. The whole group observes each performance, and at the end of each act, they should all try to guess what career the actor is trying to portray. As each group performs, have students ask yes/no questions about the career the actor is portraying.

6. After all the performances are finished, ask participants what they learned about the different jobs. Ask the group if they can think of some different skills that go into each job.

Questions:

- I'm interested in an environmental career, what kinds of jobs could I do?
- How can I prepare?

Adaptations:

Refer to general adaptations on pages 11-16.

Hearing Disabilities:

- Participants who have difficulty speaking and are acting out careers can write down their clues for the audience as they go, use the sign language interpreter, or work with a partner to do the verbal part of the presentation.
- Have all participants raise their hands to make a guess so those who have difficulty speaking have equal opportunity to participate.

Learning/Cognitive Disabilities:

- Have all participants raise their hands to make a guess to lower noise level, decreasing over-stimulation during the activity.
- Simplify the tasks/clues associated with the careers as needed. Whisper clues in the participant's ear if they get stuck.
- Have participants work with a partner to complete the act if necessary. Have the participant dress up and a partner give the verbal clues, or vice versa.
- Another option is to make a "career person" figure on butcher paper and to have clothing and props drawn on large pieces paper. Allow participants to tape the props on the figure as they give clues.

Motor Disabilities:

Overall:

- Have poster-board cut-outs of clothing/props for participants to use who have difficulty putting on additional clothes due to a mobility impairment. Participants can either hold these or you can attach them with string if the participant has trouble holding items. Assign actors an assistant if needed.
- Another option is to make a "career person" figure on butcher paper and to have clothing and props drawn on large pieces paper. Allow participants to tape the props on the figure as they give clues. Have partners assist as needed.

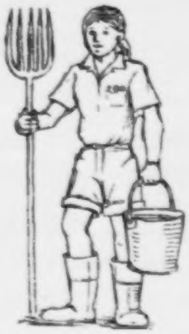
Visual Disabilities:

Overall:

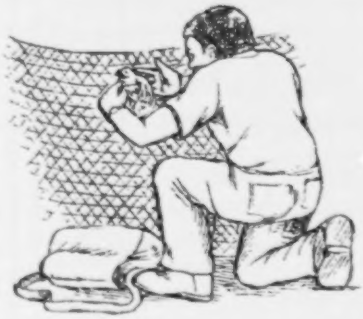
- Encourage participants who are blind and wish to be actors to practice putting on the articles of clothing and other props before hand to get comfortable with them. Consider giving the actors an assistant to hand them items if needed.
- Have participants with low vision sit up front during the guessing part of the activity.
- Narrate the action of the game for participants with visual disabilities. For example, "Jon is wearing a white coat and a stethoscope," for veterinarian.
- Have actors use increased verbal clues when presenting their careers.
- Have all participants raise their hands to make a guess so that all participants have an equal opportunity to participate.

Career Cards

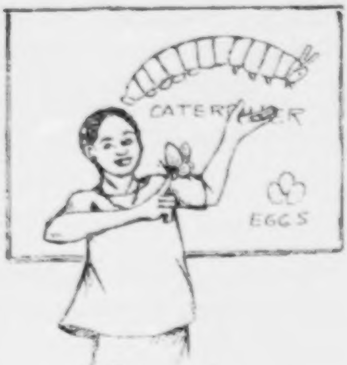
WORKSHEET



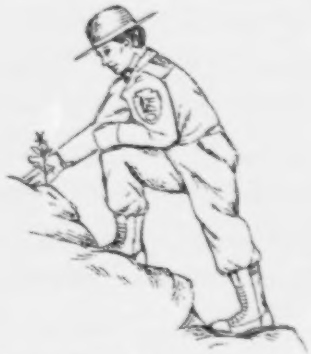
Zookeeper



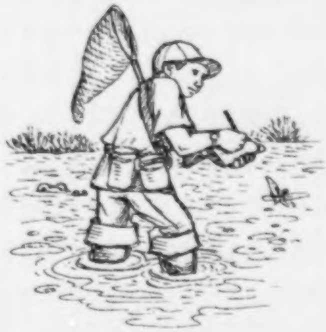
Field Biologist


CATERPILLAR
EGGS

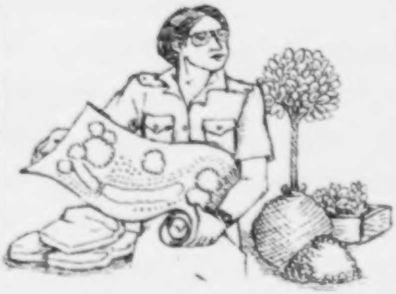
Educator



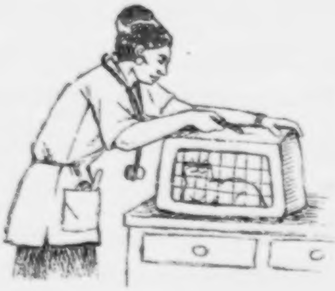
Park Ranger



Environmental Scientist



Natural Landscape Designer



Veterinarian

WORKSHEET

Career Cards

Zookeeper
animals, boots, hose, hat, long pants, snake hook, rake, food tray

Educator
books, posters, animals, chalk, markers, skulls or other artifacts

Field Biologist
animals, binoculars, field vest with many pockets, hand lens, compass, hat, bug spray, clipboard and pencil, laptop computer

Park Ranger
wide-brimmed hat, badge, binoculars, clipboard, field guide, radio

Natural Landscape Designer
overalls, shovel, garden gloves, tape measure, small plants, birdhouse

Environmental Scientist
lab coat, microscope, computer, camera

Veterinarian
lab coat, stethoscope, face mask, syringe, medicine bottle, animals, bandages

ACTIVITY
36

Ask the Expert

Summary:
Participants hear a guest speaker involved in an environmental career and have the chance to ask questions.

Grade Level:
3-8

Time:
1 hour

Learning Objectives:
Participants will be able to:
- ◇ Develop awareness of career opportunities.
- ◇ Understand the specific role of the speaker in contributing to protecting the environment.
- ◇ Conduct an interview (older participants).

Materials Needed:
- ◇ No specific materials required

Background:

A great way to educate participants about careers involving the natural world is to have a professional from a related field talk about what they do for a living. The following activity presents a format for this type of speaker to address participants.

Below are some examples of people who work to study and conserve the natural world, but this is by no means a comprehensive list. Be creative!

Field biologists, including **zoologists** and **zoo keepers** (who study animals) and **botanists** (who study plants), are often connected with a university, a government agency, a conservation organization, or a zoo or natural history museum.

Environmental educators and **naturalists** include teachers who focus on environmental issues or nature study, and local naturalists, who may be affiliated with a bird watching group, a conservation group, or a local, state, or Federal park. **Adventure educators** (e.g., kayaking, ropes course, scuba, and rock climbing instructors) and representatives from local hunting and/or fishing associations often have an environmental focus as well.

Resource specialists include those who manage, protect, and educate the public about various natural resources, including water, soil, plants, and areas of recreation. They work for government agencies such as the U.S. Forest Service, the Bureau of Land Management, the local Soil and Water Conservation District, or different state natural resource departments.

Environmental scientists include those who study air, water, and/or soil quality. Some may specialize in very specific problems, such as toxins in a particular river, and some may study large-scale environmental problems, such as global warming. Environmental scientists are often connected to a college or university, a government agency such as the Environmental Protection Agency, or a conservation organization such as the National Wildlife Federation.

Law enforcement officers include those who protect wildlife from illegal hunting and fishing and issue hunting and fishing permits, those who investigate environmental crimes, and those who enforce other park/public nature area regulations (closing times, camping regulations, etc.). The U.S. Fish and Wildlife Service, the U.S. Park Service, and state natural resource departments all have different kinds of law enforcement officers.

Environmental lawyers work to conserve land in many sensitive areas, hold government and/or busi-

nesses accountable for various environmental issues (such as water and air quality), and often help define how environmental laws are interpreted by the courts. They can usually be found in local law firms or in government agencies or environmental organizations.

Urban planners, **architects**, and **designers** often develop plans to increase the amount of green space in urban areas, and decrease the amount of habitat disruption.

Waste managers include those who run recycling facilities and/or manage toxic waste to ensure public and environmental safety.

What to Do:

1. Find a community member who works in an environmental field, and ask him or her to talk to the group about what they do for a living. If possible invite a speaker who has a disability. Several ideas of where to look for speakers are given in the Background section. You may want to ask other educators for suggestions. Ask the speaker to send you a resume or brief biography so that you can introduce him/her properly and prepare the group for his/her arrival.

2. Tell participants about the speaker beforehand, and have them brainstorm a list of questions they may want to ask the speaker. Write these questions on a large board.

3. Once you have located someone appropriate, give the speaker some guidelines about what to cover. The speaker should include, at the very least, a basic description of his or her job and other jobs like it. He/she should discuss how they became interested in this career, what kinds of education and experience they gained to become qualified, what parts of the job they like and dislike, interesting stories about things they have done while on the job, and a typical day at work. Where appropriate, have the speaker present a hands-on activity that allows participants to experience a part of the job.

***Note:** Give the speaker information on working with participants with any disabilities represented in your group to assist them in preparing an effective presentation. Provide specific teaching tips and strategies that you find useful. Encourage the speaker to make the presentation as interactive as possible, including hands-on activities and items that can be touched to help illustrate points when possible.*

4. Make any necessary arrangements the speaker needs for space or props. Be sure to confirm all arrangements with the speaker the day before they are scheduled to speak. Provide accurate directions to your site.

5. Introduce the speaker when he or she arrives. Help with the presentation and with the focus of the participants where needed.

6. Leave plenty of time for questions at the end of the presentation. Encourage participants to ask the questions they generated beforehand and to add any they may have thought of now that they have heard the speaker. Moderate the discussion. When all questions have been asked, make sure the group thanks the speaker for coming.

7. Be sure to have participants write thank-you notes to the speaker afterwards.

For Younger Participants (Grades K-2):

Be sure to find out if your speaker has experience with very young children and can adapt

Ask the Expert

ACTIVITY 36

his/her presentation to the age level of the group.

For Older Participants (Grades 9-12):

If participants show a lot of interest in careers, you may want to arrange for several speakers from different environmental careers to come and speak at various times throughout the program. Encourage older participants, either alone or in pairs, to conduct telephone or personal interviews with an environmental professional. Assemble a list of people who work in environmental careers in your community who are willing to speak to your participants. Each pair should conduct one interview, coming up with a list of questions prior to their conversation, taking careful notes during the interview. When completed, participants should present what they learned to the group. Assemble a book of their interviews into an Environmental Careers source book.

CATERPILLAR
EGGS

Questions:

- What types of things does a person working in an environmental field do in an average day?
- What types of training/education are needed?
- What interesting stories do they have to share?

Adaptations:

Refer to general adaptations on pages 11-16.

Hearing Disabilities:

- Have the speaker prepare a basic written script of the presentation ahead of time to give to the sign language interpreter.
- Encourage the participants to ask questions and actively engage in the discussion. Allow participants who have difficulty speaking to use the sign language interpreter to ask questions.
- Make any appropriate adaptations required if the speaker chooses to do an activity.

Learning/Cognitive Disabilities:

- Encourage the participants to ask questions and actively engage in the discussion.
- Make any appropriate adaptations required if the speaker chooses to do an activity.

Motor Disabilities:

Overall:

- Make any appropriate adaptations required if the speaker chooses to do an activity.

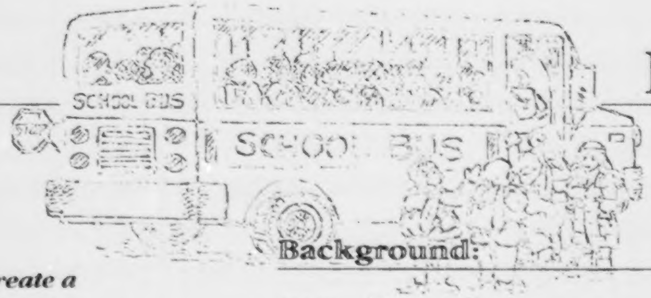
Visual Disabilities:

Overall:

- Encourage the participants to ask questions and actively engage in the discussion.
- Make any appropriate adaptations required if the speaker chooses to do an activity.

ACTIVITY
37

Pledge of Action



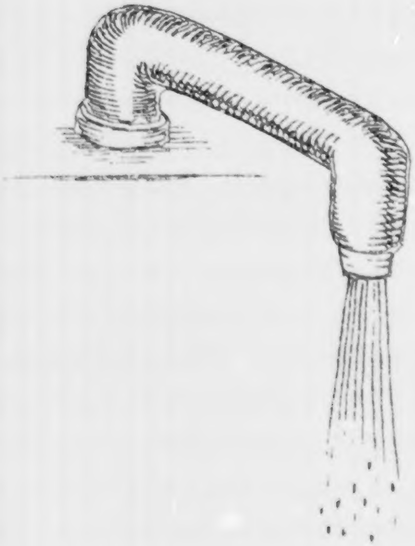
Summary:
Participants create a pledge to carry out an environmentally-friendly action.

Grade level:
1-8

Time:
30 minutes for initial activity plus follow-up

Learning Objectives:
Participants will be able to:
◇ Make a commitment to an environmental action.
◇ Evaluate personal actions toward the environment.

Materials Needed:
◇ Copies of the Pledge of Action worksheet
◇ Pens or pencils



Background:

Having participants create a pledge of action is a great way to reinforce learning and carry over environmental lessons into everyday life. A pledge allows participants to identify personal environmental priorities, and encourages them to follow through on their commitments. It is important to emphasize how individuals can put forward a small effort to generate great positive changes in the environment.

For instance, a running faucet at full blast can fill up to three gallon jugs of water per minute. If an average person turned off his or her faucet for one minute while brushing their teeth, they could potentially save 3 gallons a minute, 9 gallons a day, 56 gallons a week, and 2,902 gallons in a year!

What to Do:

1. Ask participants, *How can each one of us make a difference to the environment?* Solicit answers and write on a flipchart or board. Discuss positive human impact on the environment by explaining that all people have the power to make a difference.

2. Explain the concept of a pledge as a personal commitment to take action, making sure to point out the importance of following through on a commitment. Give several examples, such as shutting off a faucet while brushing teeth, or recycling all cans in your house, etc.

3. Ask participants to think about what environmental issues are important to them. If necessary, give sample issues such as water quality, pollution, or habitat loss. Once they have identified what issue(s) are important to them, have each participant identify specific action steps they can take to address the issue(s).

4. Consider putting the following action step examples on the board or a flip chart to assist participants in their selections. However, encourage participants to be creative and focus on what really matters to them. If desired, break participants into smaller groups and have them brainstorm ideas together.

At Home:

- Recycle paper, metal, plastic, glass, and used batteries.
- Limit showers to 5 minutes.
- Turn off lights, TV's, and radios when leaving the room.
- Wash clothes in cold water, or ask parents to do so. Hang clothes out to dry.
- Use reusable canvas bags for shopping instead of disposable paper or plastic bags, or ask parents to do so.
- Plant native trees or a garden.
- Create and certify a Backyard Wildlife Habitat.

Pledge of Action

- Water the lawn early in the morning or late afternoon only.
- Pull weeds instead of using herbicides.
- Start a compost or leaf pile.
- Educate parents and other family members about the environment and what they can do to help.

At School:

- Walk, bicycle, carpool, or ride the bus to school.
- Use recycled paper.
- Make sure your school recycles paper, metal, plastic, and glass.
- Take lunch in reusable containers.
- Create a Schoolyard Habitats site.
- Join/start an environmental club.
- Share ideas about helping the earth with peers and teachers.
- Write an article about an environmental issue of interest for the school newspaper.

In the Community:

- Pick up litter.
- Write letters to local officials and to newspapers about personal environmental concerns.
- Participate in local environmental programs such as Adopt-A-Highway or Adopt-A-Stream.
- Tread gently in the outdoors; stay on trails.
- Observe, but don't disturb wildlife and their homes.

5. Once participants have had time to think about their action steps, have them complete the pledge worksheet. Have someone serve as the witness. Once everyone has completed this task, have participants present their issue(s) of concern to the group and what action steps they will take to positively impact the environment.

6. Make a copy of the pledge to keep and send the original home with participants. Encourage them to share their pledge with their families and get them involved. For this activity to be truly effective, it is important to have some means of encouragement for participants to stick to their pledges. To follow up, have participants keep a pledge journal and/or have them regularly update the group on their progress.

Questions:

- What environmental issues are important to me?
- How can I make a difference?
- What actions will I personally take on?

Adaptations:

Refer to general adaptations on pages 11-16.

Hearing Disabilities:

- Allow participants who are have difficulty speaking to use the sign language interpreter to give their presentations to the group.
- Have all participants raise their hands to make suggestions so all participants have an equal opportunity to participate. Encourage participants to actively participate in the discussion.

Learning/Cognitive Disabilities:

- Have all participants raise their hands to make suggestions so all participants have an equal opportunity to participate. Encourage participants to actively participate in the discussion.
- Have tape recorders available for participants who have difficulty writing or have partners assist with completing the pledge worksheet.

Motor Disabilities:

- Build up pencils/pens with foam or tape as needed.
- Provide tape recorders for participants who have difficulty writing or have partners assist with completing the pledge worksheet.

Visual Disabilities:

Overall:

- Have all participants raise their hands to make suggestions so all participants have an equal opportunity to participate in the discussion. Encourage participants to actively participate in the discussion.
- Have a large print and Braille version of the pledge worksheet .
- Have participants use their own writing equipment or provide small tape recorders for individuals to use to complete the information on the worksheet.

WORKSHEET

Pledge of Action

I, ____,

pledge to help wildlife and the environment.

The environmental issues I am concerned about are:

____

____

____

I pledge to take the following action steps:

____

____

____

Signed this ________ day of ____________________, 20 ________.

Participant ____

Witness ____

Action Module: Creating Schoolyard Habitats® Sites

SECTION 6

BEST COPY AVAILABLE

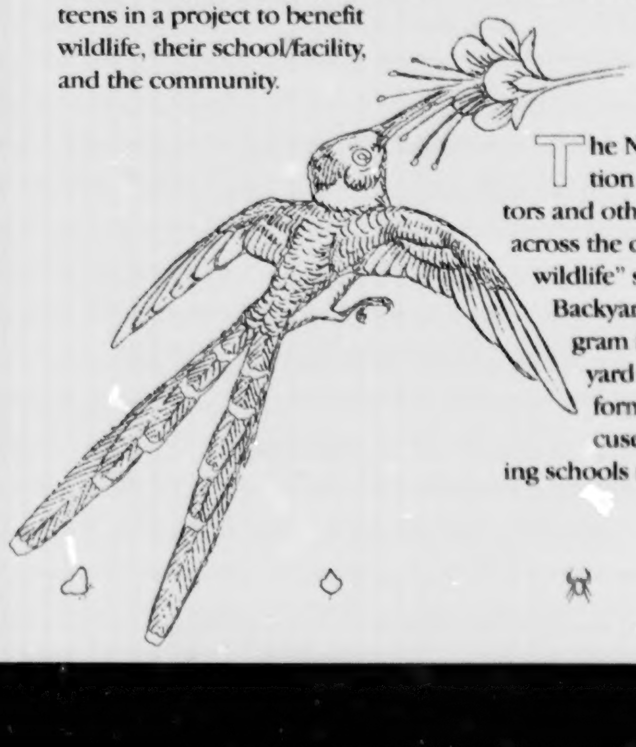
Action Module

Introduction:

Youth and teens can contribute to the conservation and restoration of habitat by creating places for wildlife in their own communities, wherever they may be. The following series of activities leads participants through the process of designing and planting a Schoolyard Habitats site in their community. However, a Schoolyard Habitats site does not have to be at a school, nor do you have to be a classroom teacher to spearhead a project. Any habitat project that is youth driven can qualify, and any youth service professional can head up a habitat project. Camps, recreation centers, schools, nature centers, public parks, and day care centers are all excellent choices for Schoolyard Habitats sites. This program offers both formal and nonformal educators an equal opportunity to engage youth and teens in a project to benefit wildlife, their school/facility, and the community.

The size and scale of Schoolyard Habitats projects vary greatly. Some groups turn a small corner of an asphalt playground into a wildlife haven with raised bed gardens and bird feeders. Others transform the entire school or facility grounds into a home for native plants and local and migratory wildlife. Regardless of where your group is located, creating a habitat site can be a rewarding experience with long-term educational and recreational benefits.

Depending on the size and scope of the project, the activities in this section consist of approximately twenty-seven hours of hands-on experience with habitat that can constitute community service or service learning hours. This section also includes guidelines for making your site accessible to all citizens in the community, including those with disabilities. See the Accessibility Guidelines (p. 241) for details.



Background:

The National Wildlife Federation has encouraged educators and others in communities across the country to "garden for wildlife" since the inception of its Backyard Wildlife Habitat™ program in 1973. The Schoolyard Habitats Program, formally begun in 1996, focuses specifically on assisting schools and youth service organizations, educators, students and community members in the use of school and other public grounds as learning sites for wildlife conservation and cross-curricular learning.

Why should we make this effort to provide homes for songbirds, butterflies and other wildlife with whom we share our communities? Habitat loss is the greatest threat to biodiversity—the great variety of life forms on Earth. No matter where we are, we can take small actions in our daily lives to make a positive impact on our local environment. At our schools, community centers, after-school programs, and learning centers, we have a chance, and perhaps an obligation, to put our youth in contact with the natural world. The Schoolyard Habitats Program offers this opportunity while enhancing the quality of education and recreation opportunities in our schools and communities.

In the previous sections of this curriculum, participants learned about wildlife habitat and the essential needs of all living species; hands-on activities introduced the concepts of the physical and living environment, and human impact. In this section, participants have the opportunity to apply that knowledge to the design, creation and development of a wildlife habitat site on their facility's grounds or in a community space. In the following pages, leaders will find information, activities and resources for establishing a habitat-based learning site, including the steps for planning, designing and establishing a wildlife habitat project.

However, you may not need to involve as many individuals as suggested in this section to create a successful wildlife habitat with youth and teens. The information is offered as a tool for all instructors to create a habitat team and process that meets the needs of their particular group, facility, and project vision. The most important thing is the desire to create a place for youth to connect to wildlife, and to commit to the use and care of the site for the future.

Examples of Habitat Loss in the United States:

- Since the late 18th century, over half of the wetlands in the lower 48 states were filled in, drained, or otherwise lost.
- In that same period, the state of California alone lost some 91% of its wetlands.
- It is estimated that 95% of old-growth forests—which tend to support the greatest biological diversity among forests—have disappeared from the United States.
- Waving grasslands, supporting grasses up to eight feet in height (taller than a horse!), once covered the state of Iowa and most of Illinois, and stretched in a broad band from eastern North Dakota to Texas. Today less than 1% of this native tallgrass prairie remains.

The Schoolyard Habitats Program:

Schoolyard Habitats sites meet the needs of wildlife by providing the four critical habitat components: food, water, cover, and places to raise young. Thousands of youth and teens have been actively involved in restoring and enhancing wildlife habitat in their communities through NWF's Schoolyard Habitats Program. Youth have become engaged with habitat projects in a number of ways—from joining their classmates and teachers in restoring the wetland behind their school, to helping their after-school environmental clubs transform an abandoned lot, to participating in a year-round program at a local nature center.

This broad definition of "schoolyard" means that in addition to certifying many public and private schools, NWF also certifies non-formal educational settings as official Schoolyard Habitats projects. Many youth educators use the Schoolyard Habitats project as the vehicle to teach service learning, career, and life skills concepts (such as decision-making, teamwork, responsibility, etc.). Other non-formal educators find these projects to be the perfect focus for their activities—an ideal way to teach hands-on gardening, woodworking, and organizational skills (among others) as participants evaluate their site, and then plan and design their site to attract wildlife through native plantings, nest boxes, feeders, water features and more. In other cases, individual youth involved in a service-oriented club will do a special project to assist the work of another group of people engaged in a habitat project. For instance, many Girl Scouts, Boy Scouts and Eagle Scouts have worked towards badges by pitching in to help a local Schoolyard Habitats project, helping with everything from trail maintenance to the construction of benches and interpretative signs.

These projects offer many benefits to participants and educators, including: enhanced hands-on learning opportunities, on-site "field trips," decreased grounds maintenance costs, meaningful opportunities for service projects, development of stronger ties within the community and a sense of empowerment and environmental stewardship in our children, both in their own neighborhood and beyond. Schoolyard Habitats sites also offer unlimited opportunities for active cross-curricular learning and a creative tool with which formal educators can meet state and national standards, and non-formal educators can meet ambitious youth development goals.

For the participants involved, creating and maintaining a habitat project provides a relevant, real-world learning experience. Creating a habitat not only gives participants a hands-on opportunity to learn about wildlife, but also empowers them to take an active role in their school, program, neighborhood and community. Working on a Schoolyard Habitats project shows participants how they can affect positive change. Reinforcing this lesson with awareness activities and continued project upkeep can help them develop in them a strong sense of stewardship for the natural world. This combination of new awareness and involvement in a successful, tangible action can foster a lifelong interest and involvement in local and global environmental issues.

Planning For Your Wildlife Habitat Site:

Inspiring the Community:
The first true step in creating a habitat site is to introduce the concept of wildlife habitat and its many benefits. The community associated with the proposed site (i.e., the camp, school, recreation center, etc.) should understand how the wildlife habitat site will enhance its educational/recreational offerings. Additionally, the wildlife habitat site enriches the landscape of the facility and can be a benefit to the entire community as a public place for all to visit!

The National Wildlife Federation can help you in your efforts to build community support. Our Schoolyard Habitats video provides images of habitat projects around the country and describes why they are important. Additionally, the video offers testimonials from participants and educators involved in habitat sites on their school grounds. The video might be a great addition to your next board of directors or PTA/PTO meeting and could result in support from these groups. Additionally, NWF can provide many beneficial resources including educator trainings and mini-grants, and can put you in touch with schools/organizations in your area that have successfully certified their wildlife habitat projects through NWF. The NWF website at www.nwf.org also has a number of articles that make the case for why a wildlife habitat site is a beneficial teaching and learning tool— both for participants and the community at-large.

Getting Started:
The most successful wildlife habitat sites are generally those created by a strong team of people. However, the size and scope of your project will determine the size and scope of your team. For example, a day camp facility creating a small butterfly habitat will not need as large a habitat team as an elementary school creating a large-scale wildlife habitat. In addition, it may not be necessary to have every team member involved in every step of the process. Some individuals may be interested in only the planning and fund-raising aspects, while others, such as community volunteers, may only wish to be involved on planting days. It is important to create and utilize the team that best fits the needs of the project.

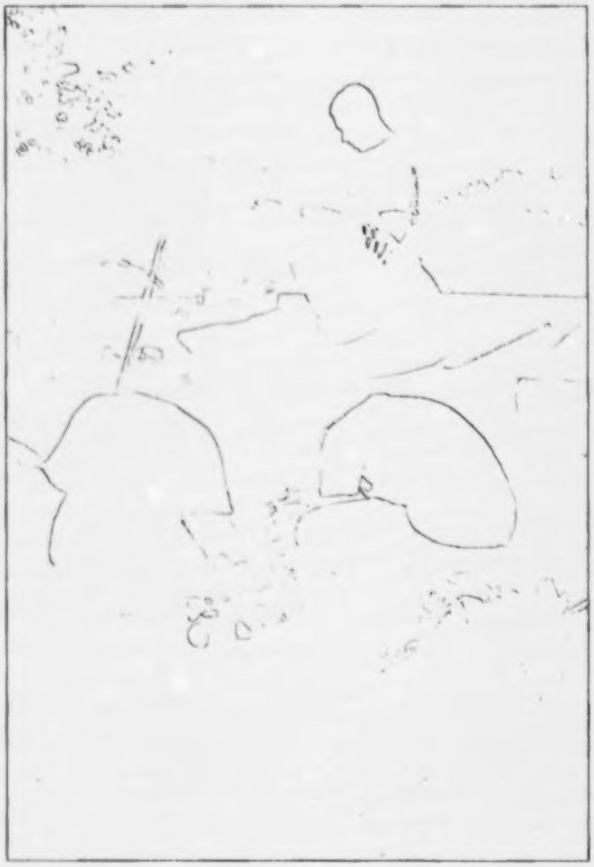
The purpose of the habitat team is not only to take the necessary steps to create the habitat but to ensure that it continues to grow and thrive for years to come. Long-term goals and commitment for continued care are essential to ensure the success of a wildlife habitat site for both participants and wildlife. It may be useful to start by sketching out the members of the Habitat Team and what each person's role might be. The worksheet that follows is one example of how you might go about organizing the team.

Creating the Habitat Team:

When looking for team or committee members, consider who in the community might have any of the varied interests and skills needed to tackle the planning, fund-raising, organizing, building, and planting involved in the development of a wildlife habitat site. Below is a list of groups that may comprise a wildlife habitat team.

Youth and Teen Participants:
Youth and teens drive this type of conservation project. As they venture forward with the project, these young participants will develop and hone leadership and communication skills. The more involved young participants are in the entire planning and implementation process, the more invested they will be in maintaining, learning from, and enjoying the wildlife habitat site. The enthusiasm and creativity of youth and teens can inspire the entire team and take the project to a new level.

Educators:
The role of educators in the process is varied: from mentor, to co-organizer, to amateur horticulturist. Involve as many of the educators who intend to use the outdoor learning site as possible in the habitat process. Educators must also keep the project on track without usurping the initiative of the youth and teens leading the project. Additional facility staff and program volunteers are beneficial additions to the team as well.



Administration:
Gaining the support of the facility administration is crucial to the planning and implementation of the habitat project. Administrators can often offer useful insight into budget concerns, future building plans, liability issues, community relations, and funding opportunities.

Maintenance Staff:
If your site employs a maintenance or grounds staff, it is vital to the project that they are consulted early in your planning process. Effective communication about site goals and ideas can go a long way towards a successful partnership. Maintenance staff may also possess helpful information about the grounds and equipment for project construction and maintenance.

Community Members:
Often the most varied habitat committees are the strongest. Look to individuals in the community as resources. Consider local residents, service clubs, volunteer organizations, youth mentors,

and the families of program participants among others to round out your team.

Parents and Guardians:
Parents and guardians enthusiastically support projects that excite and stimulate their children. Ask them to volunteer to help with the process when they are available. Many parents have found their own lives enriched through involvement in a Schoolyard Habitats project. Their enthusiasm and resources—personal and professional—are valuable assets in the life of a project. The participation of parents and family members is important in expanding the support and impact of the project into the community.

Other Organizations:
Local businesses, civic organizations and government agencies can be valuable community partners. These partners can offer technical support, material contributions, small grants, volunteers, and other in-kind donations and are a valuable resource. Such organizations may be drawn to the project due to the positive recognition they will receive in the community.

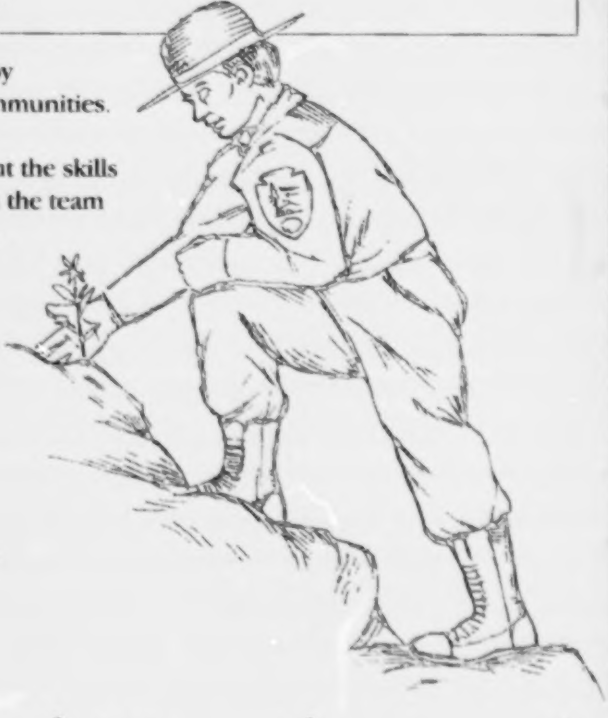
Resource Professionals:
Resource professionals offer knowledge and experience to a wildlife habitat project that may be difficult to find elsewhere. Often, individuals are willing to donate their services to gain community recognition or because they simply enjoy volunteering in their communities.

Where to Look for Community Resources:

- Cooperative Extension Service
- School PTA/PTO
- School Board of Education
- Federal and local resource management agencies (i.e., Soil and Water Conservation District, U.S. Forest Service, U.S. Fish and Wildlife Service, federal or state Environmental Protection Agency, NRCS, etc.)
- Conservation and environmental groups
- Colleges and universities
- Garden clubs
- Corporate grantors and private foundations
- Businesses (i.e., local home and garden centers, nurseries, etc.)
- Civic organizations
- Boy Scouts/Girl Scouts
- Native Plant Society
- Local Master Gardeners
- Church groups
- Neighboring businesses and/or homeowners
- Community members with NWF certified Backyard Wildlife Habitats
- Students and teachers from other schools
- Colleges and Universities
- Local landscape designers

When possible, round out the skills you have represented on the team with these professionals:

- Forester
- Cooperative Extension Agent
- Park Naturalist
- Waste Water Engineer
- Wildlife Biologist
- Land-Use Planner
- Horticulturist
- Landscape Architect
- Local Historian



Action Module

WORKSHEET

Habitat Team Planning Sheet

Site/Program: ______________________________

DIRECTIONS: Use this sheet to organize your Habitat Team. Fill in names and roles/tasks for each person. ROLES TO BE FILLED: team leader, planters, construction, photographer, budget/fund-raising, historian, maintenance, parent/volunteer coordinator, publicity, etc.

Participants: Role:

1.
2.
3.

Educators:

1. Example: Mrs. Stowell, Camp leader
2.
3.

Administrators:

1.
2.

Maintenance Staff:

1.
2.

Parents/Guardians:

1. Example: Mrs. Cooper, fundraising from local businesses
2.
3.

Local businesses or organizations:

1.
2.
3.

BEST COPY AVAILABLE

Resource Professionals:

1.
2.

Setting the Goals:

The next task of the Habitat Team is to define and set clear and attainable project goals. The construction of a habitat site may seem daunting, but it will not be overwhelming if it is developed in phases. Long-term goals are essential. However, be sure to set short-term goals that are readily accomplished. The ongoing nature of these projects allows for additional time to locate funding and materials. With each phase of habitat development, important lessons are learned.

Before setting your specific goals, take some time to develop a vision for your Schoolyard Habitats site that everyone can agree on. The process of developing this vision will aid in bringing together the community and generating enthusiasm and ownership for your project. Be sure to have everyone involved—from the participants to educators or leaders, administrators and community members. Fill out this vision sheet and then have people respond to each other's differing visions in a large meeting, in an on-line forum, or in smaller groups. If possible, devote all or part of a staff meeting or preparatory meeting to filling out and discussing both the Vision and the Goals worksheets, in addition to working with as many participants as possible on these sheets. The more people who become actively involved and interested from the beginning, the greater the chance of success for your project!

Sample Vision Statement:
"Our vision for a Schoolyard Habitats site is to provide a natural area that is aesthetically pleasing where wildlife can be observed and appreciated. This site will provide participants with hands-on experiences that enhance their learning processes."

Examples of Specific Goals:

- Dig up/dispose of asphalt on site
- Plant 7 trees/shrubs
- Create a 10' by 12' butterfly garden
- Put in 3 raised flower beds

Action Module

WORKSHEET

Schoolyard Habitats Site Vision

Site/Program: ______________________________

1. Describe how your facility's grounds currently looks:

2. What kinds of activities normally take place there?

3. If you could change your facility's grounds in one way, what would it be?

4. If you could change your facility's grounds in any and all ways, how would it look?

5. Where will your Schoolyard Habitats site be located?

6. What size will it be?

7. What will happen there? Who/what will use it?

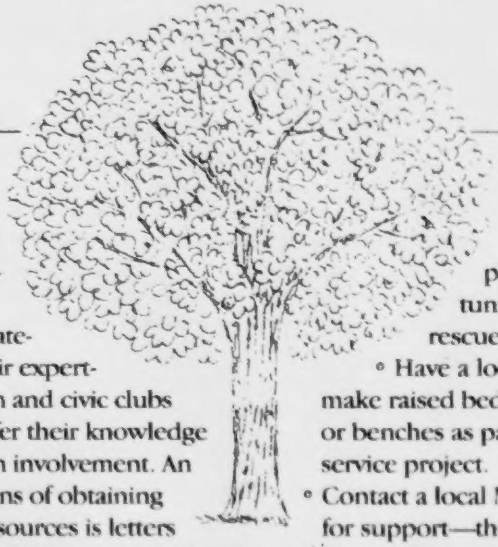
BEST COPY AVAILABLE

Schoolyard Habitats Site Goals

Long-term Goal for Our Schoolyard Habitats Site:

Short Term Goals:	Projected Completion Date:
1.	
2.	
3.	
4.	
5.	

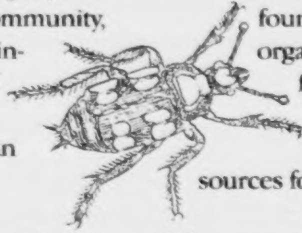
Action Module



Next Steps:

After defining clear and workable goals, the Team must establish a timeline with estimated planning, budget, and material needs. This timeline should also identify areas where assistance is needed, so the Team can develop a wish list. After completing a site inventory during the Site Mapping activity, revise the wish list to include identified gaps in material and technical needs.

Reaching Out—Resources and Community Outreach: The steps to create a habitat site begin with team-building, setting goals, and inventorying and mapping the site. The next phase involves getting the materials needed, community outreach, planting, and construction. Additionally, it will be important to involve the greater community to secure financial, technical, and other support. It is important to remember that money does not need to be a limiting factor to the success of your project. By reaching out to the community, an incredible amount of in-kind donations (i.e., staff time and/or materials) and volunteer support can be obtained.



Assistance from the community comes from a wide variety of sources: landscape architects ready for a new challenge; local businesses willing to donate plants, landscape materials, and their expertise; or garden and civic clubs excited to offer their knowledge and hands-on involvement. An effective means of obtaining donations/resources is letters generated by the participants. Local businesses and organizations are more prone to give as a result of requests directly from youth and teens. Time and effort are involved in locating these individuals or groups, but their material contributions, in-kind support, and resource connections are invaluable to the project.

Fundraising Strategies: Preparing and maintaining a habitat site often is made possible through donations of materials and time. Often, securing monetary support is necessary as well. Local and federal agencies have small grant programs to fund educational projects focused on wildlife and habitat issues. Additionally, many private foundations and non-profit organizations have money for such projects. See the resource section for potential grant sources for your project.

Below are some other creative approaches to consider:

- Contact a local gardening club or native plant society about any plant-share opportunities or plant rescues in the area.
- Have a local scout troop make raised beds, containers, or benches as part of a service project.
- Contact a local Master Gardener for support—they must do 50 hours of community service.
- Contact a local bird watching club about sponsoring bird feeders. Local hardware stores or home centers may be willing to donate birdhouse/bird feeder kits.
- Contact local natural resource or government agencies to inquire about free mulch or topsoil.
- Look for habitat sponsors in the community. For example, a local grocery store might sponsor a fountain in the habitat in return for a name plaque to increase awareness of their store.

Incorporating the Habitat in Your Program:

The way a wildlife habitat is used will vary depending on the type of site and educational focus of the program.

Non-Formal Educators: The creation and continued use of a habitat site can offer a variety of educational and recreational activities for youth and teens. It also offers educators a hands-on laboratory for learning. Participants can learn about nature, environmental science, gardening, as well as a variety of other subjects. The hands-on opportunities for involvement and learning are endless. There are numerous sources of outdoor activity ideas, many of which can be used in your new habitat site. The site also offers a place for participants to observe and reflect on nature and its ever-changing landscape.

Formal Educators:
Classroom educators have had enormous success with creating and incorporating habitat sites into curriculum. Educators find that the habitat site appeals to multiple learning styles and excites students about learning through the hands-on nature of the work. The habitat can also serve as an excellent means to integrate the various disciplines and to bring to light real-world applications of skills learned in the classroom. Educators are also thrilled to discover that many of the state and national standards across subject areas can be successfully reached through work in a wildlife habitat.

Suggested Activities:

The following list includes ideas for activities for use in your wildlife habitat, and covers a number of different subject areas.

Mathematics:
- Measure/calculate plant growth rates and flower numbers.
- Calculate the area of the habitat.
- Estimate the canopy area of a tree.
- Calculate cost savings from reduced maintenance of the land used as a habitat area.

Social Studies:
- Research past land use of the site.
- Study local Native American culture and the use of foods and medicinal herbs.
- Make the link to local/state/national conservation policy and decision-making.
- Establish and maintain food and herb plots.

Art:
- Make leaf or bark prints.
- Use plant materials for dyes and paints.
- Study the history and personalities involved in wildlife art and photography.
- Sketch flora and fauna.
- Create personal field guides.
- Create stepping stones to be laid in the habitat site.
- Create statues for display in the habitat.

Science:
- Study ecological concepts and biological processes such as plant distribution (native vs. non-native), food web, and photosynthesis.
- Learn about regional weather patterns affecting the habitat.
- Investigate microclimates influencing the animals and plants in the site.
- Observe and record life cycles of wildlife (e.g., caterpillars, tadpoles, birds, etc.).

Music:
- Create musical instruments from natural items (e.g., acorn caps and grass blades as wind instruments, seeds in a jar as percussion, etc.).
- Listen to the sounds of nature and make seasonal recordings of natural sounds from your habitat.
- Listen to and discuss songs and other musical forms that reflect the natural world.

Language Arts:
- Read and analyze natural history authors.
- Involve participants in keeping nature journals.
- Write and perform a play based on student experiences and observations of life in the habitat.
- Illustrate language concepts and forms with examples and exercises based on habitat experiences (e.g., haiku, onomatopoeia).
- Practice writing skills through exercises related to habitat development (e.g., thank you letters, invitations, project newsletters, fundraising projects, radio and television scripts,

public service or announcements to local newspapers).

These suggestions are a very small representation of the learning opportunities that a wildlife habitat site offers educators and participants alike. Let your imagination and creativity run wild! Watch the positive changes in participants as they begin to learn from and in the habitat.

Maintenance:

Creating a wildlife habitat site at a facility lessens the need for traditional maintenance in that area. However, some maintenance will be required to enable the habitat to thrive, especially until the plants are fully established.

Enlisting people to help maintain the habitat year round is vital. With the proper guidance, youth and teens can be in charge of any required maintenance during the months that the habitat is being used as an outdoor classroom. However, it must be determined who will take care of watering, weeding and general upkeep of the habitat (including keeping any feeders and water sources clean and filled) when the habitat site is not in use.

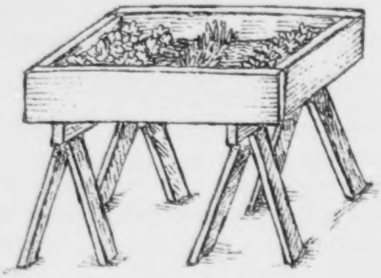
There are a variety of solutions for off-season maintenance issues. Look into summer academic or recreation programs to see if educators and/or staff are interested in using the habitat site for teaching; they, in turn, can maintain the site as part of the learning process. Other suggestions include contacting local scout troops, garden or service clubs, or neighborhood associations for maintenance volunteers. Consider organizing teams of youths and parents to take care of off-season maintenance duties.

Attention to maintenance issues is an extremely important aspect of creating a wildlife habitat site. Proper maintenance ensures that youth, teens, and wildlife can return for years to come and continue to enjoy the site's many benefits.

Keeping Contacts:

Whether from letters from participants, photographs, a semi-formal report, or a small newsletter, it is important to keep various stakeholders informed on the progress and/or use of the project.

Often, important team members, such as school board members, resource specialists, volunteer organization supervisors, business sponsors are unable to participate in the day-to-day operations of the site. These folks will appreciate communication from the team and



will often place a higher value on projects that regularly update their progress. In addition, groups that have invested time, energy, or resources in the project will be more likely to continue support if they are kept apprised of events involving the wildlife habitat.

Wildlife Habitat Site Accessibility Guidelines:

When creating a wildlife habitat site, consider the needs of people as well as wildlife, including people with disabilities. **At the start of the planning process**, create a universal design; add accessible elements to the habitat design that will enhance the usability of the space for all people (i.e., people with disabilities, senior citizens, parents with strollers, etc.).

Of course, the size and location of your habitat, as well as the budget, will impact what is reasonable for the site. However, many of the following suggestions are low cost and easily implemented. **The site design plan should include all accessible elements.** If some items are not possible in the original construction due to budget constraints, make sure to start with pathways and other basics to assure immediate accessibility. Add accessible elements such as benches into the long-range development of the habitat site.

Note: If the habitat site is developed at a public or government facility or the project funding comes from federal, state, or local government sources, the site must be accessible to people with disabilities.

The suggested guidelines below highlight overall accessibility ideas. Many of these suggestions exceed government standards in order to accommodate both the nature of gardening and multiple users in a given area. For example, pathways that exceed the government standard and are a minimum of 48 inches will give a person who uses a wheelchair ample space for gardening tools and easy maneuvering while allowing others to pass by. The additional room will also allow for multiple visitors with and without disabilities to enjoy the space at the same time. Please contact the United States Access Board at www.access-board.gov for the complete Americans With Disabilities Act Accessibility Guidelines (ADAAG).

Location:

- Choose a site that is largely accessible (i.e., level, easy to get to, does not flood, etc.).
- If possible, place the habitat close to a building. This is useful for all individuals, providing access to a water source, tool storage, and restroom facilities. Take advantage of existing paths or sidewalks for access.

Pathways:

- **Width:** Optimal recommended width is 60 inches with a minimum recommended width of 48 inches.
- **Surface:** Should be firm and stable. Recommended surface options include pavement, textured concrete, and screenings. Screenings are made from a mixture of small pieces of rock (no greater than 1/4 inch in size; typically limestone or greenstone) and dust to stabilize it. Brick and boardwalk style pathways become slick when wet and can be a safety risk. Rock, wood chip, and stepping stone paths are not recommended.
- **Slope:** Recommended five percent or less running slope (grade). Recommended cross slope is two to three percent.

Ramps:

- Any time the grade of a path exceeds five percent a ramp is required. If a ramp is needed, the least amount of slope possible is recommended. A maximum acceptable slope is 1:12 (e.g., a one-inch rise for every twelve inches of distance). Ramps are required to have a level, 60 inch minimum landing immediately before and after a sloped run, and a landing must be installed for every 30 feet of sloped run.

Handrails:

- Handrails are recommended for safety purposes any time an element such as a ramp or bridge is present on a path. The gripping surface of handrails should be between 1 1/4 and 1 1/2 inches wide. Recommended handrail heights for adults should be 34 to 38 inches; heights for children should be 20 to 27 inches.

Obstacles:

- Paths should be free of any obstacles such as roots, rocks, and/or steps. There should be ample head and side clearance (i.e., from tree branches) for individuals at standing and seated levels. It is important to maintain pathways for safety.

Planting Beds and Containers:

- Create raised planting beds or boxes to accommodate individuals who use wheelchairs, senior citizens, and others with limited mobility. There are a variety of styles and heights that can be used. If possible, use a mixture of heights to accommodate the greatest range of individuals.
- Create a sensory garden in a raised bed or standing planter box

for individuals with visual impairments. This allows individuals to comfortably explore and experience the plantings.

- Use trellises to raise plants vertically to provide access to plants for a greater number of individuals.
- Containers are an inexpensive way to create raised plantings. Whiskey barrels and other large planters are an excellent way to raise the height of plantings. In addition, you can use plant stands or existing walls to place containers at different heights.
- If possible, create a multi-layered landscape design to increase access to all individuals.

Tools:

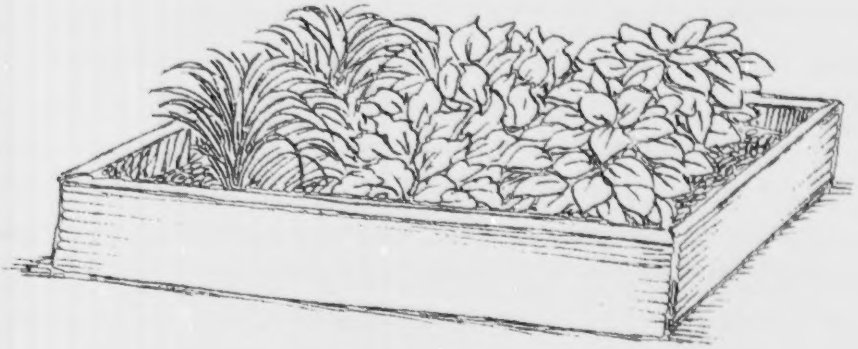
- A variety of adaptive gardening tools are available, including long-handled tools, and lightweight and comfort grip tools. The handles of traditional gardening tools can be modified with tape/foam/or bandage material for gardeners with limited muscle strength, coordination, or dexterity of the hands. You can also use simple household items such as ice cream scoops and long-handled spoons.
- Have gardeners who have difficulty carrying items wear an apron with pockets or secure a lightweight bag or basket on their wheelchair or walker.
- If possible, provide a tool storage shed in or near the habitat.
- To increase comfort, have gardeners who have difficulty bending or have joint pain use kneelers, kneepads, or a small stool.
- Use tools with brightly colored handles or paint or tape the handles in a contrasting color to provide contrast for gardeners with low vision.

Signage:

- Interpretive signs should not be text heavy; text should be in large, no-glare block letters. Label in Braille. When possible, utilize pictures and/or symbols.
- Make Braille/large print plant labels for raised bed sensory gardens.
- For larger public gardens, incorporate an auditory interpretation system into signage.

Miscellaneous:

- Add benches for people to rest. Benches should have back supports and an arm rest on at least one end for safety purposes. If possible, place benches in shade. Recommended spacing for benches is no greater than 100 feet, depending on the size of the habitat.
- Choose plants for scent and tactile recognition for gardeners/visitors with visual impairments.
- Use sound producing elements such as wind chimes, a waterfall, or fountain to help provide orientation in the habitat for gardeners/visitors with visual impairments.



Creating the Wildlife Habitat:

Once the Team is established and the pre-planning is done, it is time to start creating the habitat. The following activities will move the group through the habitat process sequentially, allowing all members of the Team to learn and have fun in the process. **Good luck!**

ACTIVITY
38

Site Mapping

Summary:

Participants take inventory of their potential habitat site.

Grade Level:

3-12

Time:

1 hour or more, depending on size of area and number of participants

Learning Objectives:

Participants will be able to:

- Identify existing natural and man-made characteristics of available land.
- Create a basic map of available land.
- Select an appropriate site for the creation of a habitat area within available land.

Materials Needed:

- Field guides
- Paper and pencils
- Clipboards (if available)
- Compasses
- A large poster or interactive creation to show different parts of compass
- Sample site maps or drawings
- Overhead projector and transparencies—OR—Graph paper, poster board or butcher paper
- Different colored overhead transparency markers,—OR—crayons, and/or colored pencils
- Rulers and markers

For younger participants:

- Field guides with large color pictures
- Butcher paper or cardboard
- Colored clay, construction paper, and/or building blocks
- Items to represent different parts of site
- Scissors, and glue

Background:

Before your team makes any decisions about where or what they will plant in their habitat site, they should have a good sense of the current characteristics of the land on which they will work.

Participants should understand where the cardinal directions (north, south, east and west) are in relation to their site. This way, they can orient themselves on a map of the area and, if they understand the east-west path of the sun, they can also predict sunny and shady areas. With this knowledge, they can later indicate **degrees of sun and shade** with symbols on their map. Then, come planting time, plants may be arranged according to their different preferences for sunlight.

All maps should begin with defined borders, followed by large permanent features such as buildings and roads. Other features on a wildlife habitat site map include degrees of sun and shade on the site, traffic patterns, water flow/topography, existing vegetation, signs of wildlife, soil types, history, and nearby land use.

Traffic patterns should include natural traffic patterns of people or vehicles as they move across or near the site. Patterns can be observed as they occur (i.e., by watching where people walk) or by investigating impacts or signs (i.e., by observing trails, packed soil, tire tracks or roads). A group planning a wildlife habitat site in a schoolyard, for example, should observe where school children walk and play so that they can plan a site in lower traffic areas, and lessen the potential for trampled plants. They should also consider wheelchair access.

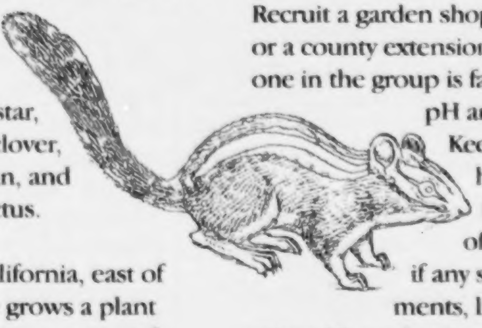
Water flow includes where water appears (as in streams, ponds, or even large temporary puddles), how it runs across the site when it rains, and where rain might go when it runs off a nearby roof. New plants can drown or be torn out by rainwater pouring straight off a roof, though if it is captured properly, it can be an excellent source of water for the habitat. Related to water flow is **topography**. This refers to the lay of the land, the high and low points, and where there are slopes, ditches, bumpy places, and flat stretches. An understanding of the topography enables a group to locate good, relatively flat areas to consider.

Existing vegetation includes all types of plants on the site. With a decent inventory of the different plants that already grow on their site, a group will know which beneficial native plants to leave and which aggressive plants to control or remove so that they do not overrun the area. Familiarity with existing vegetation will also help the group decide which plants will fit into the different plant "communities." Some regional field guides (e.g., "Eastern Forests," "Grasslands", or "Pacific Coast" of The Audubon Society Nature Guides) help define plant communities.

Examples of Plant Communities:

- Near a wide creek in an eastern forest, river birch, sycamore, spicebush, greenbriar, wild grapes, poison ivy, Virginia bluebells, and May apples might all grow in the same cluster, which in this case could be called **riparian community**.

- In a **shortgrass prairie** just east of the front range of the Rocky Mountains, grasses like buffalo grass, blue grama grass, prairie dropseed, and little bluestem might grow in the same area. Broad-leaved herbs called forbs might also be found within, including: prairie blazing star, purple prairie clover, black-eyed susan, and prickly-pear cactus.



- In Southern California, east of the coast, there grows a plant community known as **coastal sage scrub**. On a southerly-facing slope, plants might include California buckwheat, coyote bush, sawtoothed goldenbush, golden yarrow, and various sages.

Signs of wildlife include actual sightings of animals, tracks, and animal feces. Determining what kinds of wildlife already visit a site will help the group pick plants or other features to enhance these animals' habitats. A group might also plan to attract specific animals that would normally be found with others, but are missing key habitat elements. Tracking field guides are available in most libraries and bookstores.

Soil types do not have to be too technical. Having a grasp on the site's soil type will help narrow down the plant selection process. Most plants are suited to a certain type of soil, depending on its pH level (*Is it acidic or alkaline?*) and its composition (*Is it mostly sand, silt, or clay? How much organic material is present?*).

Recruit a garden shop representative or a county extension agent if no one in the group is familiar with soil pH and composition. Keep in mind, however, that these tests are often done to see if any soil amendments, like lime (to raise pH) or aluminum sulfate (to lower pH), need to be added to make the soil "better." Plants that are suited to their soil thrive well with the addition of compost or other organic materials, so other soil amendments are usually unnecessary.

Examining the **history of the site** will give participants an idea of what was there before. They may want to consider what they find out as they plan what they want the site to look like in the future. Knowing some of the site's history may also shed light on the kinds of plants and animals they may find currently or may try to entice back to the area.

Nearby land use indicates how the site's neighbors utilize the adjacent property. A little woodland that is wedged between two shopping centers will likely not be a safe place for deer to forage, but it might be a good place for birds to visit as they fly through the area. A group faced with this scenario would get better results if they focused on attracting birds. Participants can indicate nearby land use with arrows pointing to adjacent land and a phrase or diagram about what is happening there.

What to Do:

1. Begin the activity by asking participants, *Do you know how to make a map? What kinds of information does a map give you?* Tell them they will help to create a map of their area. This map will include many different features of the site.

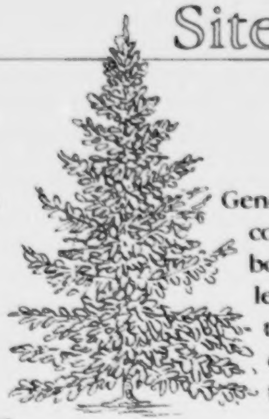
2. Construct a base map of the site. The participants can help create this map, but the instructor should make sure that it accurately reflects what the site looks like. The base map should be a fairly simple outline of the area. It should include all borders, such as property lines, sidewalks, roads, etc., and any large permanent features such as buildings, fences, power lines, and ball fields. The base map can be drawn on a transparency and shown on an overhead projector (if an overhead projector is not available, or if the majority of participants are 4th grade or below, see the note on the next page.

***Note:** It is extremely important that all underground cables (power, television, and telephone), gas lines, and water pipes are identified on some sort of plan well before any digging occurs. Contact local utilities for information about this, and include this information on the base map.*

3. If the base map is on a transparency, create several copies and place them each on a separate clipboard or other portable hard surface. Put another transparency on top of the base map copy. This way, participants have a template on which they can work.

4. Divide participants into small groups. If possible, assign a volunteer to assist each group. Show the finished base map to participants, and take them through it in detail. They should be able to identify several landmarks on the map.

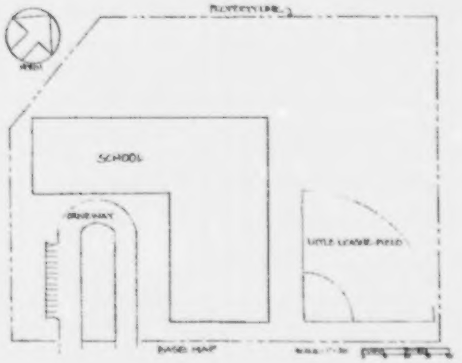
5. Hand out clipboards and a compass to each group. Explain to participants that once they are outside, they should try to locate north with the compass, and then find it on the map. If anyone does not know how to use a compass, bring a large diagram of a compass to explain how it works.

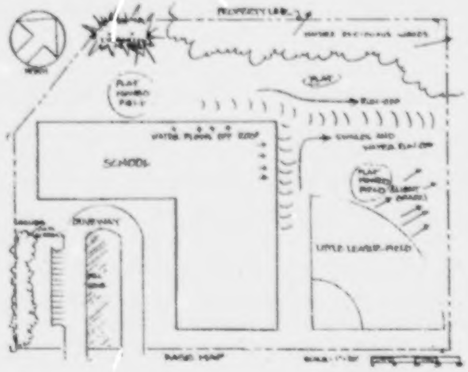


Generally, a new compass will come with an instruction booklet, but make sure at least one leader or volunteer is adept at using a compass before beginning this exercise.

6. Once outside, show participants how to use the compasses, and let them try to figure out which part of the map points to the north. Tell them to find a corner of the map, draw a small arrow on it so that the arrow is pointing north, and label the arrow with the letter "N."

7. Check and make sure that the arrows are all pointing the same way, and that each group can name a few of the features on the map before going to the next step. Participants need to know where they are in relation to things on the map so that they draw their feature maps in the same direction. Otherwise some of the maps may have water flowing uphill, or a big tree in the middle of a building participants thought was





BEST COPY AVAILABLE

a field. Participants should also understand that the sun rises and sets to the right and left (east and west) of north, and that in most of North America, especially in the late fall, winter, and early spring, it forms an arc slightly to the south.

8. Once they have oriented themselves, explain to participants that they will help to add different features to the map. Show participants a list and/or drawings of the different features they will research. Assign each group to one of the following teams and give each team the appropriate inventory sheet to assist them (see Background section for definitions):

- Traffic Patterns Team
- Water Flow/Topography Team
- Existing Vegetation Team
- Wildlife Signs Team
- Soil Team
- Sun/Shade Team
- Adjacent Land Use Team (optional)
- History Team (optional)

9. The group members should help draw their assigned site feature on their transparency. Each site feature should be drawn in a different color to avoid confusion.

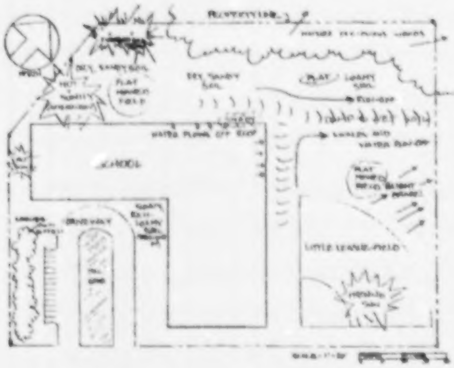
10. Once groups have finished with their site feature maps, bring them back inside and place the base map on the projector. Put each feature map on the projector one by one. Have the group explain each portion of their map. If participants are working from a piece of graph paper, have them show their maps and discuss what they found.

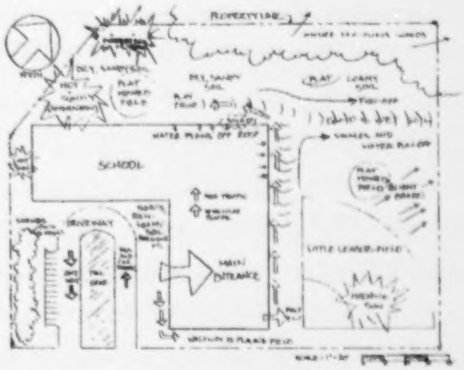
11. Place all the transparencies on the projector one at a time until they make one very detailed map. Ask participants if all the maps together show them a good place for their project. If all the pieces together are too confusing, use only one or a few transparencies at a time for this discussion. Wrap up by reinforcing the importance of the site map. Ask the participants if they learned anything about the site that they did not notice earlier.

Note: *If an overhead projector is not available, create the base map on a large piece of poster or butcher paper. Make small copies of the base map on pieces of graph paper and have these serve as the site feature maps for participants. Another option is to put tracing paper over the graph paper so that the base map can be reused. When everyone gathers together after they have investigated their site features, have them explain what they found and draw their part on the large map.*

For Younger Participants (K-2):

Younger participants, especially those in 4th grade or below, will have trouble with the abstract qualities of a two-dimensional map. For this age group, break participants into small groups and have each group investigate a





BEST COPY AVAILABLE

different aspect of their site, using simplified versions of the features in the Background section. If possible, have volunteers oversee small groups.

Next, have each group create a clay or construction paper model on butcher paper or cardboard. This base should have a basic outline of the site drawn on it. When all the groups are finished, go around and discuss each site model. Ask participants what they learned about their site. Wrap up by having the group look for patterns in the different feature models that might point to a good place to put their habitat site.

Questions:

- What features does your habitat site have?
- What can you discover about your site by an investigation?
- Where should your site be located?

Adaptations:

Refer to general adaptations on pages 11-16. Refer to Accessible Wildlife Habitat Guidelines on p. 241.

Hearing Disabilities:

- Clearly mark a perimeter boundary with flags or rope.
- Position yourself and the sign language interpreter so the participants can see you for further directions or warnings while in the field.
- Encourage participants to actively participate in the discussion. Allow participants who have difficulty speaking to use the sign language interpreter to present their maps to the group.

Learning/Cognitive Disabilities:

- Have field guides with large colored pictures available.
- Clearly mark a perimeter boundary with flags or rope.
- Mark north, south, east, and west on the compass with different colored dots to make it easier to read; mark the dots with the appropriate corresponding letters (N, S, E, W).
- Simplify team tasks as needed; make appropriate changes to the worksheets.
- Have participants who have difficulty writing draw pictures of locations/items.
- Have partners assist with reading, identification, and labeling the map as needed.
- If appropriate, consider completing the younger participant version of the activity.

Motor Disabilities:

- Select a site that is largely accessible. Refer to Accessibility Guidelines on p 241.

For participants with limited muscle strength, coordination, or dexterity of the hands:

- Provide clipboards.
- Build up markers with foam or bandage material as needed.

Visual Disabilities:

Overall:

- Clearly mark a perimeter boundary with a guide string.
- Encourage partners to assist participants to truly explore the site by touch, scent, and guided commentary.
- Have large print and Braille versions of the worksheets available.

For participants with low vision:

- Have participants use four pieces of drawing paper allowing them to make their site map in sections and then gluing the sections together on a piece of cardboard or poster board. This can also be done using four overhead transparencies.
- Find the largest compass possible. Mark north, south, east, and west on the compass with different colored dots to make it easier to read; mark the dots with the appropriate corresponding letters (N, S, E, W).
- Provide clipboards and black markers for participants to use.
- Provide a variety of magnifiers.

Site Mapping

ACTIVITY 38

For participants who are blind:

- Provide a Braille compass.
- Have participants make a model of the site out of clay on a foam tray or box lid. Have any permanent features marked ahead of time with fabric, outlined in glue, or use other items (e.g., a sponge to represent a pond or a film canister to represent a building).
- An alternative method is to have participants create their site map by gluing different items (i.e., seeds, rice, beans, etc.) to a piece of cardboard or a box lid (with the assistance of a partner). Have any permanent features marked ahead of time with fabric, outlined in glue, or use other items (e.g., a piece of sponge to represent a pond or a film canister to represent a building).
- If possible, have a Braille labeler available for participants to label their site map and/or make a key.

WORKSHEET

Traffic Pattern Team

Team Name: ______________________________

DIRECTIONS: Answer the following questions based on what you observe on site.

1. Use of the site by people on foot:

2. Bicycle use:

3. Pathways for wheelchair access:

4. Auto use:

5. Any pathways or wildlife trails:

6. Any potential conflicts with your habitat site?

7. What questions do you have regarding traffic patterns that were raised by your investigation?

8. How might you try to answer them?

Water Flow/Topography Team

WORKSHEET

Team Name: ______________________________

DIRECTIONS: Answer the following questions based on what you observe on site.

1. Do you observe any hills, valleys, or slopes?

2. Where does water flow when it rains?

   a. Are there areas that usually hold puddles?

   b. Why?

3. Make note of any pipes, storm drains, or sewers on your map:

4. How often does it rain in your area? How much rain does your area get per month or per year?

5. What kinds of questions do you have about the topography of your area and how it will affect your choice of site?

   a. How will you answer them?

WORKSHEET

Vegetation Team

Team Name: ______________________________

DIRECTIONS: Do a survey of the vegetation at your site; note each kind on your base map. Complete the questions below.

a. Deciduous trees:

b. Evergreen trees:

c. Shrubs:

d. Long or short grass:

e. Natural areas:

f. Landscaped areas:

1. What kind of each type of vegetation do you see? (Use field guides to try to identify each one.)

2. Are there a lot more of one type than another? Why do you think that might be?

3. What questions do you have about the vegetation that you've found here?

Soil Team

WORKSHEET

Team Name: ______________________________

DIRECTIONS: Gather at least 5 soil samples from different areas of your grounds. Pick areas that have different kinds of vegetation growing, or different topography—such as a hill, by a stream, under a tree, on the open ground, etc. Compare the color, texture, and moisture content of each sample.

Sample #	Color	Texture	Moisture	pH

1. What questions do you have about the soils you found at your site?

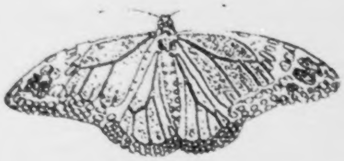
2. How might you start to answer them?

WORKSHEET

Signs of Wildlife Team

Team Name: ______________________________

Your Location: ____ Time of Day: _____________________

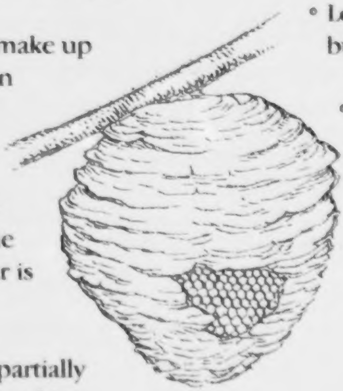
Wildlife Observed	Where?	Doing What?	Sketch
Ex: Butterfly	on flower	eating	

Wildlife Clues

WORKSHEET

DIRECTIONS: Look for these wildlife clues on your site.

- Green leaves with irregular edges are a clue that someone's been eating that leaf—it could be an insect or a deer.
- Hairs caught on a fence suggests that a fox, sheep, rabbit or other mammal might live close by.
- A trail that leads nowhere (or under fallen logs and through bushes) might be a path made by a number of different animals such as a deer or rabbit.
- Pieces of moth or butterfly wings may be evidence of a bat, bird, or spider meal.
- Gnawed or stripped tree bark could be the calling card of rabbits, squirrels, deer or even some wood-eating insects. Bark carved with initials suggests a different suspect — a human.
- A fish skeleton suggests an otter or mink may have eaten a fish.
- A flattened circle of grass or leaves may indicate that an animal has been lying down in that spot.
- See feathers on the ground? They are probably all that's left of a bird killed by a predator.
- A cave in the base of a tree might be a fox den.
- Medium-sized holes in the ground might mean a rabbit's burrow. Rabbits also make grass nests along sandy banks, under bushes or in fields. Look for rabbit pellets (feces) and fur near the holes.
- Leaves and twigs make up a squirrel's nest on tree branches or in tree holes.
- A tree with a hole bored in it is a clue that a woodpecker is active nearby.
- A tree hole that's partially filled in with dry mud is a nuthatch nest.
- A spider web (whole or broken) might have a spider clinging to it.
- A small crumbly mound with a hole on the top is a sign of an anthill.
- Twigs and branches carefully put together in a nest are the work of a bird. To find bird nests, look high and low, in shrubs, grasses and in trees. Building ledges, eaves of houses, telephone poles and other man-made structures also provide good spots for nests.



- A gall (a strange outgrowth on a tree that looks as if a baseball or other object was stuck under the bark) may mean that insects are inside.
- Look out for a busy hive buzzing with bees!
- Search the ground for animal tracks (use a field guide to help you identify).
- Small holes in ground may be home to spiders or beetles, though yellow jackets also live in underground hives, so take care not to get too close.
- Gnawed fruit stones and seeds mean a mouse, vole, squirrel or other gnawing rodent is probably near.
- Egg masses left on leaves are probably from an insect.
- Listen for sounds of bird songs or insects buzzing.
- Mounds of dirt suggest that there are mole tunnels below surface.

WORKSHEET

Sun and Shade Team

Team Name: ____

DIRECTIONS: Choose a sunny day to do your investigation. On a scale of 1-5, record on your map how much sun is falling on different sections of the potential site. Places that have no shade at all and are under bright sun should get 1's, while those that are under complete shade should get 5's. Use your judgement for areas in between. Record air and soil temperatures at each location. Try to repeat your observations and measurements at two other times of the day, to compare.

Full Sun	1	2	3	4	5	Full Shade

Location	Time Recorded	Sun/Shade Rating	Air Temp.	Soil Temp.

1. What questions do you have about the temperatures and sun/shade conditions you discovered?

2. Why is it important to know which areas are sunny or shady before choosing plants for your habit at site?

Land Use Team

WORKSHEET

Team Name: ______________________________

DIRECTIONS: Do a survey of the area (N,S,E,W) surrounding your site. (Information on how your site's neighbors use their land will show how your habitat will be affected.)

1. How is land used on your facility's grounds now?

2. How do your site's neighbors use their land?

3. How might that affect your wildlife habitat project?

4. Do a survey of the surrounding areas, recording on all sides what you find. (Ex. forest, buildings, pool, etc.)

Direction from Site	Land Use	Possible Effects on Our Site
Ex: North	road	may generate fumes, noise

What other questions do you have about land uses in your area?

WORKSHEET

History/Local People Survey Team

Team Name: ____

DIRECTIONS: In your group, generate a list of questions that you would like answered and a list of people you think you might be able to help you answer them, or whose opinions you would like to consider. Before the interview, make up an interview sheet, with all your questions written out, and with room for answers. Conduct an interview with each person (at least 3 different people), recording his or her answers carefully. Be prepared to present your findings to the whole group. Some ideas are below, but add your own—these are only to get you started!

People to interview:

- Long-time town resident
- Principal/Administrator
- Parent who attended your school/facility many years ago
- Local farmer
- Local business people
- Local nature center director
- Urban forester
- Long-time educator

Sample questions:

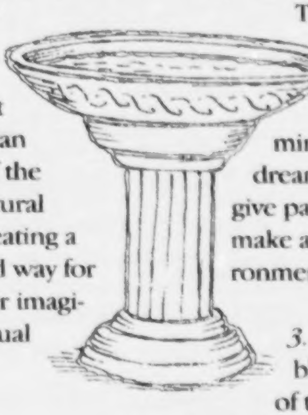
1. How long has this site been here?
2. What was here before?
3. Do you remember seeing any wildlife here many years ago? What kind?
4. What do you think of having a wildlife habitat site here now?
5. Do you think it would help or hurt local business?
6. Do you have any concerns about a habitat site here? What are they?

Dream Habitat

ACTIVITY 39

Background:

When creating a wildlife habitat site, it is important to design a space with both wildlife and people in mind. While each habitat site is unique, all sites share some common features. These features include plants, soil, nutrients, sun, water, access (pathways/places for people), and a basic design plan. No matter what size or type of wildlife habitat site your group is creating, it is important to sketch out a basic plan that takes advantage of the available space and natural resources at hand. Creating a dream habitat is a good way for participants to use their imagination to begin the actual design process.



What to Do:

1. Tell participants that for this activity they will imagine the great possibilities of their habitat project, and then they will create an artistic version of their ideas.

2. Before launching into the activity, take some time to trigger participant imagination. The richer and more varied their experience with gardens and wildlife habitats prior to the activity, the more detailed their dream maps will become. Depending on time and resources, take the group to a nearby botanical garden, community garden, or a certified Schoolyard Habitats site to give them ideas about their own site.

When visiting a garden or natural area, make sure participants have quiet time to enjoy the place, write in a journal or talk about how they feel when they are there, and what they like about the outdoor area. These pleasing features are the types of things they will want to have fresh in their mind when they create a dream habitat. This will also give participants a chance to make a link between the environment and how they feel.

3. If a field trip is not feasible, consider sharing some of the wonderful gardening books written for children (depending on the ages in the group). Stories with illustrations of gardens visited by wildlife and children, or that contain a wide variety of garden features, would be ideal. Also consider books which tell stories of the successful transformation of a small area into a flourishing garden, such as City Green, by Dyanne DiSalvo-Ryan or The Garden of Happiness, by Erika Tamar. Other educators might simply choose to have participants close their eyes, while they read a vivid description of a wildlife habitat and all that a visitor might hear, smell, feel and see while there.

Summary:

Participants take time to imagine the possibilities of their habitat project and create an artistic version of their ideas.

Grade Level:

2-8

Time:

1-2 hours

Learning Objectives:

Participants will be able to:

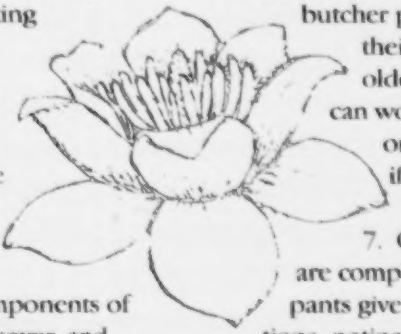
- ◇ Compile and synthesize information collected in prior activities to develop ideas for their habitat site.
- ◇ Create a model wildlife habitat site.
- ◇ Apply their ideas to the design process for their habitat site.

Materials Needed:

- ◇ Graph/drawing/butcher paper
- ◇ Markers/crayons
- ◇ Rulers
- ◇ Pencils/erasers
- ◇ Gardening magazines and catalogs
- ◇ Scissors
- ◇ Glue
- ◇ Various art materials such as craft sticks, cotton balls, etc.

4. After visiting an inspirational outdoor area, participants will be ready to design their dream habitats.

Take participants to the location of their future habitat site to remind them of its size and shape. Give them quiet time to sit in the area, make note of what is currently there and begin thinking about wildlife they would like to see invited into their habitat and new features they would like to see added. Gather participants together and remind them of the four essential components of habitat (food, water, cover, and places to raise young) that must be included in their design. Have them think about other features they might enjoy in the habitat. Encourage participants to design elements that invite humans, including a reading area, benches, or a path.



5. If they went on a field trip, as recommended above, have them review notes and think about the features of the outdoor space they liked. Prior to the activity, find a few library books or magazines for participants to browse through for ideas. Bring in books on garden seating, water or fountains, or on native plants and animals. Many gardening books, even those geared to adults, have beautiful color photos. Have participants browse through the books and magazines before getting started.

6. Allow participants to make a sketch of the habitat. Then, supply a large variety of art materials so participants can make colorful, 3-D models of their dream habitats. Younger participants can use butcher paper to create their habitats, while older participants can work to scale on graph paper, if desired.

7. Once their models are completed, have participants give short presentations, noting important or special features of their habitat to the group. You may want to keep track of the features and components that appear most often in their dream habitats.

8. After presentations, guide participants to decide on the most appealing and critical elements that will need to be included. Ask participants to compile a list of the most popular features included in the dream habitat designs. For example, if the majority of the group chose to include a birdbath in the design, this may be something that should be included in the actual site design.

Discuss with the group until they come to a consensus (or majority) on the elements and features from their dream habitats that should be included in the site design. Have participants refer back to their Vision worksheets (if they used them) and compare their initial thoughts to their current ideas. *How much of the original vision is still there? What has changed, if anything?*

Questions:

- What features would you like to see in your dream habitat?
- What kinds of animals do you want to attract?
- How will you provide the four habitat elements?

Adaptations:

Refer to general adaptations on pages 11-16. See field trip safety suggestions on pages 17-18.

Hearing Disabilities:

- Give the sign language interpreter a copy of any books you will be reading to the class ahead of time so they have time to prepare.
- Encourage participants to actively participate in the discussion. Allow participants who have difficulty speaking to use the interpreter to give their presentations to the group.
- Follow appropriate field trip precautions. Have a set meeting place in case anyone gets separated from the group.

- Position yourself and the interpreter so that participants can see you in the field.

Learning/Cognitive Disabilities:

- Briefly review habitat elements and give examples of each.
- Provide gardening magazines and/or catalogs so that participants who have difficulty drawing can cut out pictures and enhance their dream habitats.
- Encourage participants to actively participate in the discussion.

Motor Disabilities:

Overall:

- Choose an accessible site for the field trip.

For participants with limited muscle strength, coordination, or dexterity of the hands:

- Build up the handles of pencils or markers with bandage material or foam as needed. Use large crayons for younger participants.
- Provide gardening magazines and/or catalogs that participants who have difficulty drawing can cut pictures from to enhance their dream habitats.
- Have adaptive scissors and large glue sticks available.
- Have some pre-cut pictures for participants to choose from as needed.

Visual Disabilities:

Overall:

- For the outdoor portion, use vivid words to describe the natural area to help stir participants' imaginations. Describe colors, textures, smells, and sounds. Encourage partners to work with participants to explore the site.
- If possible, use hands-on examples to illustrate habitat site components.
- Have partners assist as needed.

For participants with low vision:

- Provide paper, clipboards, and black markers for participants to take notes while outside.
- Have a variety of magnifiers available.

For participants who are blind:

- Provide small tape recorders for participants to take notes while outside as needed.

BEST COPY AVAILABLE

ACTIVITY 40

Site Design

Summary:

Participants create a site plan for their habitat project.

Grade Level:

3-12

Time:

1 hour or more if broken up over several days.

Learning Objectives:

Participants will be able to:

◇ Compile information they have collected to create a working design plan.

◇ Determine appropriate habitat type based on an analysis of compiled information.

◇ Describe how their site plan meets the four basic needs of wildlife.

Materials Needed:

◇ Field guides

◇ Butcher paper or poster board

◇ Pens, pencils, markers, crayons

◇ Construction paper, masking tape, and scissors (optional)

◇ Different objects of various shapes and sizes to represent habitat elements

Background:

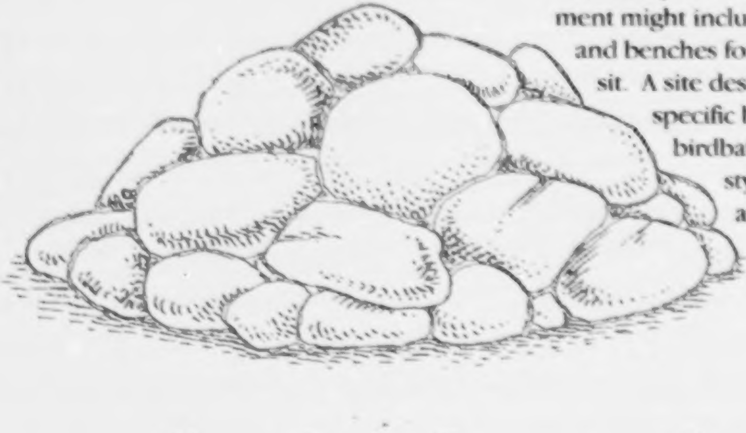
A group will create a better design plan for their habitat site if they consider site location, existing features of the area, the type of habitat, the kinds of wildlife they wish to attract, the function the habitat will serve, and who will use the site. Some of these considerations may have been covered if the group has made a map of the general area (schoolyard, recreation center, empty lot, etc.) in the Site Mapping activity. If so, they should revisit their site maps.

It is important to address where the site will be located because that will largely determine what type of plant community (i.e., woodland, meadow, wetland, prairie, desert, coastal, etc.) might best fit in that area. Soil type, moisture, and sun and wind exposure will all influence how well different plant communities will grow on a given site. Participants can research the requirements of different plant communities themselves, or they can enlist a local gardening expert to help.

Terrain features and vegetation that already exist on the site should be considered in the design as well. For example, a rotting log or a pile of rocks might serve as a habitat for insects, which in turn might serve as food for salamanders, lizards, some types of birds, and so on.

A wildlife habitat site attempts to meet the basic needs of wildlife: food, water, cover, and places to raise young. Plants and other features added to the design should support this effort. If the participants are not familiar with the basic needs of local wildlife, they should either do some research "Habitat Hunt" on p. 166, is an excellent way to facilitate this research) or consult a local expert, such as a game warden or park ranger.

Finally, the design should take into consideration the function of the area and the people who will use it. For example, a learning environment might include an open space and benches for a small group to sit. A site designed to attract specific birds might have a birdbath, a specialized style of birdhouse, and an unobtrusive place for people to watch them.



Site Design

ACTIVITY 40

What to Do:

1. Tell participants that they now have the opportunity to create a working plan of their habitat. Once the site has been chosen, have the group revisit their findings in the Site Mapping activity. It is important for them to be familiar with existing features of the area. If they have completed the Dream Habitat activity, they should have these handy as inspiration or as a source of ideas.

2. If they have not already done so, have the group decide what sort of wildlife habitat elements would be the best fit for the site. They may need field guides to do some research.

3. Go out to the proposed site and have participants decide the dimensions of their habitat site. Mark off and measure the outline of the plot.

4. Draw, or have participants draw, a large outline of the habitat on butcher paper to be placed in a large open area on the floor so that everyone can see and work on it. Include physical boundaries and any elements that will not be changed by your project (e.g., large trees, a stream, a permanent walkway, etc.) and that are very close to the plot.

5. Determine which plants or other elements, such as rotten logs or large stones that the group would like to keep in the same spot. Have participants draw these elements on the map. Keep in mind that the group can move small, existing plants from one spot to another, though it is easier for the group and easier on the plants if they stay where they are.

6. As visual aids, provide participants with objects of varying shapes and sizes. These will represent plants or other habitat elements, so they should be labeled. Have the group design the site with these objects. Try to get the different objects to match the scale of what each represents. For instance, if a soda can with a big green circle of construction paper on top were supposed to represent a tree and its canopy, it would be best to find a much smaller object to represent a small perennial flower. Participants should be able to remove, add, or change positions as many times as they wish before settling on a set design, so use rolled up masking tape or some other non-permanent means of attaching objects to the design map.

7. Remind participants what a full-grown version of the plant will look like, including how far its roots will spread. Participants should also keep in mind how plant communities in their area grow. For example, too much space between plants in an area with lush vegetation can serve as a welcome mat for invasive species. Placing plants too close together, on the other hand, can cause unwanted competition for sunlight, nutrients and water.

8. Finally, participants should make a more or less permanent version of the design plan on the butcher paper. This can be done by taping shapes made from construction paper on the map or simply drawing directly on the map. It does not have to be an architect's masterpiece, but it should be a good plan to work from. Stay flexible; the finished site might not end up looking exactly like the original plan.

Note: *Be sure to incorporate appropriate accessibility features into the site design. Refer to the Wildlife Habitat Accessibility Guidelines on page p. 241. Review with the participants as needed.*

For Younger Participants (Grades K-2):

1. Do Steps 1-5 as above, but in Step 2, have descriptions and/or pictures of different habitats available to help them in their "research."

2. Younger participants may not be able to relate to the abstract qualities of a design map (Step 6) alone. For a more active alternative, participants can decide on a set design and imitate it on the actual site

with their bodies representing different elements.

For instance, someone can stand up with their arms outstretched to represent a tree, others can hold their hands down and stand as a shrub, and still others can crouch down and act as perennials. This way they can work out any problems that immediately stand out.

Questions:

- What will go in your habitat site?
- What kind of habitat will it be?
- How big will it be, and where will it be located?

Adaptations:

Refer to general adaptations on pages 11-16.

Hearing Disabilities:
- Clearly mark a perimeter boundary with flags or rope.
- Position yourself and the sign language interpreter so the participants can see you for further directions or warnings while in the field.
- Encourage participants to actively participate in the discussion. Allow participants who have difficulty speaking to use the interpreter to present information to the group.

Learning/Cognitive Disabilities:
- Clearly mark a perimeter boundary with flags or rope.
- Have field guides with large colored pictures available. Have partners assist with identification as needed.
- Have pre-cut habitat element pieces available for participants who have difficulty writing or cutting.
- Complete the younger participant version of the activity as appropriate. Narrate the action as needed.

Motor Disabilities:
Overall:
- Select a site that is largely accessible.
- Post the butcher paper on the wall at appropriate wheelchair level so participants have access.

For participants with limited muscle strength, coordination, or dexterity of the hands:
- Have adaptive scissors available. If possible, have adaptive tape dispensers available.
- Have pre-cut habitat element pieces available for participants who have difficulty writing or cutting.

Visual Disabilities:
Overall:
- Clearly mark a perimeter boundary with a guide string.
- Use vivid words to describe the area. Encourage partners to actively engage the participants in the exploration of the site; allow a few minutes for participants to explore and get a good feel for the overall area.
- Complete the younger participant version of the activity as appropriate. Narrate the action of the activity as needed.

For participants with low vision:
- Have the boundaries and permanent features drawn on the map in heavy black marker.
- Use larger pieces of construction paper in contrasting colors to tape onto the base map. Have thick black markers available to label the map in large print.

For participants who are blind:
- Outline the base map boundaries and permanent features in glue or string.
- Have participants glue items (e.g., cotton balls, film canisters, toilet paper rolls, etc.) on the map to indicate different elements.
- If possible, have a Braille labeler available to label the design map.

Plant Selection

ACTIVITY 41

Background:

There are many factors to consider when choosing plants suitable for a particular wildlife habitat site. For one, the group must look closely at where the plot will go. Geographic region, the amount of sun exposure an area receives, the existing plant community, the type of soil, and the size of the plot will all play a big role in narrowing down the selection of plants. Group members should also consider the aesthetics of the site, which include color scheme, height, and overall layout. It is very important that the group have a goal in mind as to the type of plant community they want (e.g., woodland, grassland, wetland, desert, etc.), and what kinds of wildlife they want to attract.

It is also important to focus on diversity; selecting a variety of plants will help create a multi-dimensional landscape. Have participants choose a mix of ground covers, flowers of different heights, shrubs, and trees to create both vertical and horizontal growth. If possible, include plants that will: 1) provide nectar, seeds, fruit; 2) increase insect numbers to provide the greatest variety of food sources for wildlife; and 3) provide year-round food sources. Remember, the greater the variety of species planted, the greater the variety of wildlife species attracted.

The best plants for a wildlife habitat project are those that are native to the area. **Native plants** are species that were present in the local landscape at the time of European settlement. Over thousands of years these plants have adapted to the climate, soil, and water conditions of the area. Because they are well adapted to their region, native plants tend to need less water and fertilizers, and therefore less maintenance, than do other plants. Local wildlife have similarly adapted to their surroundings, so native plants best meet their food and cover needs, and provide good places for them to raise their young. Finally, while some native plants (like blackberry vines) are aggressive, native plants in general will not out-compete other plants in a natural area or more broadly in an ecosystem but instead generally enhance biological diversity.

On the other hand, **exotic plants** are plants that were imported from a different region (those in the U.S. often come from Asia or Europe). Frequently, these plants do not thrive in their new landscapes without increased use of resources, either natural (e.g., water) or synthetic (e.g., synthetic fertilizers and pesticides). In general, exotic plants are unable to sustain a wide variety of wildlife. They also can be **invasive**, which means that they reproduce rampantly and replace native (sometimes endangered) species.

Summary:

Participants select plants for their habitat project.

Grade Level:

4-12

Time:

1 hour (This activity can be a research project for older participants, lasting several weeks.)

Learning Objectives:

Participants will be able to:

- ◇ Define native and exotic plants.
- ◇ Identify at least three benefits to planting native species.
- ◇ Improve decision-making skills.
- ◇ Select plants for their wildlife habitat site.

Materials Needed:

- ◇ Field guides, gardening catalogs/magazines, and other reference materials
- ◇ Copies of the Plant Selection worksheet
- ◇ Pencils

BEST COPY AVAILABLE

Native plants are available at many nurseries and garden centers. For more information on native plants and invasive exotic species contact your state natural heritage agency, or native plant or wildflower society. These can be found under "links" on the Lady Bird Johnson Wildflower Center's website at www.wildflower.org. County and state agricultural extension offices are also good sources of information. For additional information and web links, visit the National Wildlife Federation's web page at www.nwf.org/habitats.

When selecting plants, match the sun, soil, and moisture needs of plants with the appropriate areas available in your site. For example, plant a purple coneflower (*Echinacea purpurea*) in full sun or partial shade, and in well-drained soil. Note also that certain plants grow better in particular zones (regions) due to climate and other factors. Zone maps should be included in most plant guides and are available at local garden centers.

What to Do:

1. Ask, *What should we plant in our habitat site?* Explain why it is important to select a variety of plants for the wildlife habitat site. Discuss the terms "native" and "exotic." If possible, give local examples of each. Discuss with participants the benefits of using native plants, both for the environment and gardeners (the participants, in this case!).

2. Review the four elements of habitat (food, cover, water, and places to raise young) and discuss how different plants can meet different needs. For example, an oak tree can provide food, cover, and places to raise young for squirrels. Instruct participants to keep the four major needs of wildlife in mind as they select their plants.

3. Review the data from the Site Mapping activity to remind the group what type of sun, soil, and moisture conditions they are working with. Explain that sun, soil, and moisture needs of selected plants should match the sun and soil conditions of the site. Encourage participants to select a variety of plants (e.g., different heights, foods produced, etc.) to enrich site diversity. Review the type of plant community that is being created (e.g., woodland, grassland, desert, wetland, etc.) for the habitat so that the appropriate plants are selected.

4. Have plant/flower field guides and other resources available. If possible, have a list of recommended species for your region and/or region specific field guides available to help participants narrow their search. Depending on time allotted for this activity, consider condensing a list of native plants, trees, and shrubs from the regional native plant list. Instruct participants to select a certain number of species from each list (e.g., eight plants, three shrubs, and two trees). Have participants select more plants than needed, as availability of native plants will vary.

5. Break participants into pairs or small groups to complete the Plant Selection worksheet. If possible, have volunteers assist groups in researching and selecting appropriate plants for the wildlife habitat site. Have pairs/groups present the plants they selected to the group.

6. Facilitate a group vote on the most appropriate plants for the site. From this, create a group version of the Plant Selection worksheet. Explain the need to choose alternates, in case some plants are not available at time of purchase.

Plant Selection

ACTIVITY 41

Questions:

- What kinds of plants do we want at our habitat site?
- Why should we choose native plants?
- Are they appropriate for the area in which our habitat will be located?

Adaptations:

Refer to general adaptations on pages 11-16.

Hearing Disabilities:

- Use pictures and/or hands-on examples of both native and exotic plants to help illustrate the discussion.
- Allow participants who have difficulty speaking to utilize the sign-language interpreter for their small group work and presentations. Encourage all participants to write down comments and questions in their small groups to ensure effective communication.

Learning/Cognitive Disabilities:

- Use pictures and/or hands-on examples of both native and exotic plants to help illustrate the discussion.
- Have field guides with large colored pictures available.
- Provide a list of plant options for participants to choose from. This will help narrow their search.
- Simplify the worksheet as needed.
- Have small tape recorders available for participants who have difficulty writing, or have a partner assist with completing the worksheet. Participants can also draw symbols to represent items (e.g., a sun for plants that require full sun, etc.).

Motor Disabilities:

For participants with limited muscle strength, coordination, or dexterity of the hands:

- Build up the pens/pencils with foam, tape, bandage materials, or putty as needed.
- Have small tape recorders available for participants who have difficulty writing, or have a partner assist with completing the worksheet.

Visual Disabilities:

Overall:

- Use hands-on examples of both native and exotic plants to help illustrate the discussion.
- If possible, have resource materials available in alternative formats (large print, Braille, and/or audio cassette).
- If participants do not have writing equipment available to them, have small tape recorders available or have a partner assist with completing the worksheet.

For participants with low vision:

- Have a large print version of worksheet available.
- Provide thick, black markers for participants to use.

For participants who are blind:

- Have a Braille version of the worksheet available.

WORKSHEET

Plant Selection

DIRECTIONS: Fill in this worksheet with native plants that best fit the soil composition, drainage, and sun exposure for your site. If available, use both common plant names and the genus and species names.

	Plant Name	Plant Name	Plant Name	Plant Name
Wildlife Attracted				
Blooming Season				
Height				
Flower Color				
Soil Type & Acidity				
Moisture Needs				
Sun Exposure				

Breaking New Ground

ACTIVITY
42

Background:

Breaking new ground will mean different things to different people. A group planting a habitat at the edge of a woods may decide to remove a few of the more aggressive shrubs and/or exotic plants, loosen the soil in selected spots and plant there. Some groups in more urban areas may have gotten permission to tear up asphalt, or they may have to build raised beds. A team putting a wildlife habitat in a wetland area would need to keep soil disturbance to a minimum. Once the group has assessed the possibilities of prepping their site, the digging, loosening, pruning, root cutting, and rock removal may commence.

More often than not, "new ground" will include a portion of lawn, often a tough mat of shallow-rooted, flat-bladed grass. It is important as a first step to remove this non-native, aggressive grass from the site. Aggressive plants that were introduced from another region are called **invasive exotics**. These exotics will crowd out native plant species and greatly reduce the diversity of plant and animal life in the area. See the background section of "Plant Selection" for more information about invasive exotics.

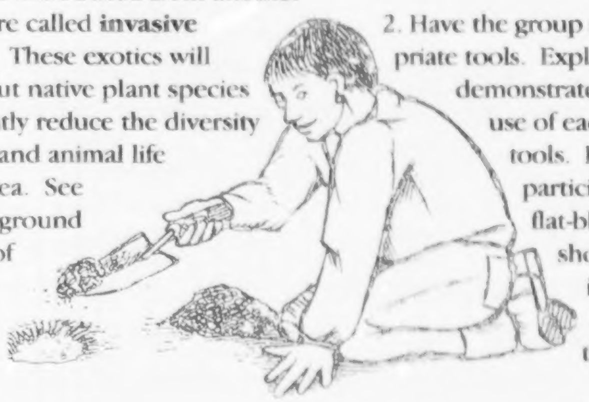
Since the method of preparing a site is so variable for each site, the information included here is very general. Resources specific to a particular type of site and methods of site preparation might include regional gardening books, websites, a local expert, and/or a local garden center.

What to Do:

1. The group should first assess what sort of preparations they need to make for the site(i.e., debris removal, asphalt breaking, creating raised beds, etc.). A detailed site map (p. 245) will provide clues, as will a well thought out design (p. 262).

Note: Make sure you have identified all underground cable (electric, telephone, etc.) or water pipes before any digging begins!

2. Have the group select appropriate tools. Explain, and demonstrate the proper use of each of the tools. For example, participants using a flat-bladed shovel should only use it to cut into soil and pry, they should



Summary:

Participants begin the project by clearing and preparing the ground.

Grade Level:

2-12

Time:

2 to 8 hours or more, depending on size of habitat and number of participants

Learning Objectives:

Participants will be able to:

- ◇ Demonstrate basic use of gardening tools.
- ◇ Utilize basic safety precautions.
- ◇ Use tools to prepare site for planting.

Materials Needed:

Largely dependent on circumstances. The number of items will depend on number of participants. Some examples include:

- ◇ A flat-bladed, sharp shovel, for cutting sod, prying soil, or removing plants
- ◇ A pointed shovel
- ◇ Gardening gloves
- ◇ A hand mattock (looks a little like a small tomahawk), for cutting roots
- ◇ A wheelbarrow and buckets, to move plants, soil, or tools
- ◇ Pruning shears, to cut vines branches, or saplings
- ◇ A tree saw (curved blade) for larger work
- ◇ Stakes (and a mallet), string/rope, logs, or some system to mark off the area
- ◇ Pitchfork or hoe, to loosen the soil

keep hands and feet away from the blade, and they should always keep the blade end below knee level. Break into small groups and have participants practice using tools. If possible, assign a volunteer to assist each group. To prevent injury, it is important to review proper lifting techniques. Have participants practice lifting with their legs, knees bent and back straight.

***Note:** This is not a comprehensive set of safety precautions. Compile a set of safety precautions by contacting the tool's retailer, manufacturer, or other reliable source. Make sure to read all pertinent labels.*

3. Assign specific jobs and areas for each participant and explain each job as it comes up. (Some of the major job descriptions follow.)

4. Mark off the site. If the plan includes loosening a good deal of soil, take preventative measures so that a lot does not wash away. An erosion prevention device might be as simple as lining the plot with 3"-5" diameter logs and staking them in place.

5. Remove plants that will negatively impact the site, especially aggressive, fast-growing exotics. Try to leave native plants when possible, as they may be beneficial to the local wildlife. Watch carefully for poison ivy, poison oak, poison sumac, thorny plants, and stinging nettles. (If these plants grow in the area, and no one in the group knows how to identify them, consult a field guide or a local expert.) The removal process will vary for different types of plants.

6. Since it is such a common and usually daunting task, here are some options for lawn grass removal:

- One option is to lay down cardboard on the plot, and cover the cardboard with at least 6 inches of leaf mulch. This not only kills the grass; it makes for good, rich soil. Starting this process in the fall gives the cardboard and mulch time to degrade. Planting should begin only after the cardboard has degraded enough for roots to maneuver through.
- Another way to kill the grass is to put a big piece of green or clear plastic over the plot and let it bake in the sun. If this is done in mid-summer, the grass is relatively short, and the plastic stays intact, it may take as little as two to three weeks. It may take a few months at other times of the year. It should be done when grass is actively growing (i.e., lawn-mowing season).
- Some people choose herbicides when working with very large plots of lawn grass. Only licensed professionals should handle herbicides. They are aware of safety issues, know what time of year to apply them, and know how much they need to apply. If this is the only option, do some research

Breaking New Ground

ACTIVITY 42

and recommend herbicides that biodegrade quickly and do not stay in the system for a long time. Otherwise herbicides can kill other plants, leach into and poison the groundwater, or run off into streams and do much more damage than was intended.

- A sod-cutter will cut the sod into strips, which can be rolled up, removed and saved for compost. An experienced adult should run this machine. Sod-cutters are available for rent at local equipment rental centers.
- A group with a small plot and a lot of muscle power can cut and pry out sod with a sharp, flat-bladed shovel. Cut small squares, about 1-2 inches deep, and pry out the pieces of sod. Set the squares aside and use them later for compost. Note, however, that lawn grass is hardy stuff; it will grow back (even upside-down!) given the chance. Several weeks under a plastic tarp in warm weather should kill it and make decent compost.

7. Once sod and any invasive plants are removed, where necessary cut roots and break apart tough soil with a hand mattock. Generally, it is not necessary to totally till the soil. In most areas the plants will do fine if the soil is loosened enough for roots to spread. The depth of soil to loosen depends on the needs of different plants.

8. Pull out medium-sized rocks, and set them aside. A rock pile on the site can provide shelter for beneficial insects, toads, chipmunks, etc. Leave small and really big rocks. The small ones will not hurt anything, but attempting to move the really big ones might hurt the mover. Removing a large rock will also leave a big, hard-to-fill cavity in the ground.

9. When the soil is ready, it is time to start planting!

Note: Have water, sunscreen, and a first aid kit available. Take appropriate rest breaks.

Questions:

- How can we use tools to break ground on our project?
- How much grass will we need to remove?
- How can we begin our project safely?

Adaptations:

Refer to general adaptations on pages 11-16.

Hearing Disabilities:

- Label each tool. After you demonstrate, have participants practice using tools in an open space before digging begins.
- Clearly mark a perimeter boundary with flags or rope.
- Ensure that participants are adequately spaced for safety purposes.
- Use a flag or other visual symbol to indicate rest breaks or information briefs.
- Position yourself and the sign language interpreter so the participants can see you for further directions or warnings while in the field. Check in with participants periodically.

Learning/Cognitive Disabilities:

- Label each tool; use different colored dots for participants who have difficulty reading. After you demonstrate, have participants practice using tools in an open space before digging begins.
- Clearly mark a perimeter boundary with flags or rope.
- Ensure that participants are adequately spaced for safety purposes.
- Position yourself and any volunteers so the participants can see you for further directions or warnings while in the field. Check in with participants periodically.

Motor Disabilities:

Overall:

- Select a site that is largely accessible.
- If possible, have adaptive gardening tools available.
- Allow participants who are comfortable to work at ground level. If possible, provide a tarp for participants to sit on.
- Ensure that participants are adequately spaced for safety purposes.
- Allow participants to work on

preparing any raised beds, planting boxes, or containers in the habitat.

- Provide bags or aprons with pockets to assist participants with carrying items as needed.

Visual Disabilities:

Overall:

- Clearly mark a perimeter boundary with a guide string.
- Use volunteers to promote safety, assist participants, and fully engage them in the activity.
- Give each participant and their partner adequate space to work for safety purposes.
- If your site is large, use a whistle to signify rest breaks or warnings.
- Allow participants who are comfortable to work at ground level. If possible, provide a tarp for participants to sit on.
- Position yourself and any volunteers so you can see the participants to ensure safety and make sure that all participants are actively engaged in the activity. Check in with participants periodically.

For participants with low vision:

- Paint or tape the handles of garden tools a bright color such as yellow to provide contrast to the grass and soil.

For participants who are blind:

- Give participants adequate space to work at the ground level.
- Have partners provide orientation directions for safety.
- Consider having a practice session before hand for participants who have not had experience gardening.
- Allow participants to work on preparing any raised beds, planting boxes, or containers in the habitat.

Planting Your Wildlife Habitat Site

ACTIVITY 43

Background:

After weeks of researching, planning, and preparing it is now time for the real fun—planting the habitat! Participants will be thrilled to see their plans become an actual wildlife habitat.

While there are general planting guidelines to follow, each plant is unique. Most plants, seeds, and bulbs come with suggested planting depths and spacing measurements, as well as sun and soil requirements. If this information is not provided, ask the nursery staff for planting suggestions.

When planting, keep in mind the size of each plant at maturity. At the same time, it is important to remember that things grow closer in nature and often grow in clusters, so do not be afraid to group plants together to form tight-knit communities. If large gaps are left between plants, nature will fill them in, often with unwanted invasives that can take over the habitat. Spacing decisions should be made prior to the day of planting.

What to Do:

1. Gather all required equipment. Plants should be purchased ahead of time. If possible, take the group on a field trip to a nursery to purchase the plants. The site should already be prepped; see "Breaking New Ground" for complete details.

Review the site design plan for the habitat with the group, including what plants go where. Go over general planting instructions (e.g., hole size, watering, mulching, etc.). Consider planting a shrub or plant as a demonstration. Review tool and safety issues as needed.

2. Divide participants into groups, assigning each group a certain area of the habitat to plant. If possible, assign a volunteer to assist each group. Give the participants area/plant specific instructions including how far apart plants should be spaced.

3. Begin planting. Remember, enthusiasm is contagious, so have a great time digging in the dirt!

4. Have participants label plant markers (available at nurseries and garden centers) in permanent ink. Place in appropriate spots throughout the habitat to identify plants and educate visitors. Following the site design plan, have participants place additional elements in the habitat (e.g., benches, bird feeders, etc.).

***Note:** Have water, sunscreen, and a first aid kit available. Take appropriate rest breaks.*

Summary:

Participants plant their selected vegetation on the habitat site.

Grade Level:

K-12

Time:

2 to 6 hours or more, depending on size of habitat and number of participants

Learning Objectives:

Participants will be able to:

◇ Demonstrate basic proper planting techniques and requirements.
◇ Place appropriate plants in their new habitat site, according to their site plan.

Materials Needed:

◇ Gardening gloves
◇ Shovels
◇ Rakes
◇ Hand trowels
◇ Water source (hose, watering can, etc.)
◇ Buckets
◇ Plants (i.e., trees, flowers, shrubs, seeds, etc.)
◇ Tree protectors (if planting seedlings)
◇ Mulch
◇ Compost or other organic material
◇ Plant markers and a permanent marker

ACTIVITY 43

Planting Your Wildlife Habitat Site

Planting Guidelines:

Plants and Shrubs:

Dig a hole the same depth and slightly wider than the container the plant came in. Remove the plant from its container and gently loosen the roots. Place in the hole and cover with backfill (soil from the hole). Gently pat down the soil to be sure there are no large air pockets; water, and apply mulch.

Trees:

Dig a hole twice as wide and no deeper than the container the tree came in, or the height of its rootball. Remove the tree from its container or burlap wrap. Gently loosen the roots and place in the hole. Water for several minutes. Fill in the hole with backfill, pat down the soil and apply mulch. Be careful not to pile mulch around the tree trunk, as this traps heat and moisture and can cause the bark to rot. Use a tree protector (available at nurseries or through gardening catalogs) when planting seedlings. This will protect small trees from errant lawn mowers and hungry deer.

Bulbs and Seeds:

- Refer to planting directions on packaging; water, and mulch. If desired, start seeds several weeks in advance as an additional activity for participants.

Soil:

- If the soil is in poor condition in the area, mix some organic material such as compost in with the backfill. Be sure to match plant needs with soil conditions. Adding soil amendments can slightly alter the soil quality, but the basic needs of a plant must be met by the existing soil for the plant to thrive.

Watering:

- Apply water generously, making sure to reach the roots and not just moistening the surface. After the initial planting, water approximately once a week with 1 inch of water, although amount will vary with weather conditions and soil type. If possible, water with a soaker hose or other drip irrigation system. Native plants will require watering periodically for a full growing season to help them become fully established. Once established, they should not require watering except in times of extreme drought.

Mulching:

- Apply at least a 1 inch layer of mulch to the soil surface. There are a variety of mulches available including wood chip, leaf, and pine needle. Use what is readily available and fits the project budget. Not only does mulch look attractive, it helps hold in moisture, adds nutrients, and helps cut down on weed growth.

Adaptations:

Refer to general adaptations on pages 11-16.

Hearing Disabilities:

- Label each tool. After you demonstrate, have participants practice using tools in an open space prior to starting digging.
- Do an actual demonstration of each of the tasks you assign a group. Ask questions to assure that participants understand the task at hand.
- Clearly mark a perimeter boundary with flags or rope.
- Ensure that participants are adequately spaced for safety purposes.
- Use a flag or other visual symbol to indicate rest breaks or information briefs.
- Position yourself and the sign language interpreter so the participants can see you for further directions or warnings while in the field. Check in with participants periodically.

Planting Your Wildlife Habitat Site

ACTIVITY
43

Learning/Cognitive Disabilities:

- Label each tool; use different colored dots for participants who have difficulty reading. After you demonstrate, have participants practice using tools in an open space prior to starting digging.
- Do an actual demonstration of each of the tasks you assign a group. Ask questions to assure that participants understand the task at hand.
- Clearly mark a perimeter boundary with flags or rope.
- Ensure that participants are adequately spaced for safety purposes.
- Position yourself and any volunteers so the participants can see you for further directions or warnings while in the field. Check in with participants periodically.
- Use large-sized plant markers; if possible, have participants secure pictures of the plants on the markers in addition to writing their names (pictures often come with plants when purchased).

Motor Disabilities:
Overall:

- Select a site that is largely accessible.
- If possible, have adaptive gardening tools available. You an also use simple household items such as ice cream scoops or long handled spoons, or build up the handles of tools with tape or bandage materials as needed.
- Ensure that participants are adequately spaced for safety purposes.
- Allow participants who are comfortable to work at ground level. If possible, provide a tarp for participants to sit on.
- Allow participants to work on preparing any raised beds, planting boxes, or containers in the habitat.
- Provide bags or aprons with pockets to assist participants with carrying items.

Visual Disabilities:
Overall:

- Clearly mark a perimeter boundary with a guide string.
- Use volunteers to promote safety, assist participants, and fully engage them in the activity.
- Give each participant and their partner adequate space to work for safety purposes.
- If your site is large, use a whistle to signify rest breaks or warnings.
- Allow participants who are comfortable to work at ground level. If possible, provide a tarp for participants to sit on.
- Position yourself and any volunteers so you can see the participants to ensure safety and make sure that all participants are actively engaged in the activity. Check in with participants periodically.
- Use large-sized plant markers that can be labeled in both large print with a permanent black marker and adhesive Braille labels.

For participants with low vision:

- Paint or tape the handles of garden tools a bright color such as yellow to provide contrast to the grass and soil.

For participants who are blind:

- Give participants adequate space to work at the ground level. Have partners provide orientation directions for safety.
- Consider having a practice session before hand for participants who have no gardening experience.
- Allow participants to work on preparing any raised beds, planting boxes, or containers in the habitat.

ACTIVITY
44

Creating a Habitat Care Guide

Summary:

Participants create a guide for on-going care and maintenance of their habitat site.

Grade Level:

5-12

Time:

1-4 hours, depending on the number of plants and elements described in the guide and the number of participants contributing to its creation.

Learning Objectives:

Participants will be able to:

- ◇ Research and record the care needed for plants and other elements in their habitat.
- ◇ Create a written (or electronic) guide that clearly explains the care needed for plants and other elements in their habitat.
- ◇ Organize wildlife habitat information in a logical and creative manner.

Materials Needed:

- ◇ White or colored paper
- ◇ Construction paper
- ◇ Glue
- ◇ Scissors
- ◇ Stapler
- ◇ Pens and pencils
- ◇ Colored pencils, markers and crayons
- ◇ Plant/field guides
- ◇ Care instructions that accompanied the plants when purchased
- ◇ Pictures of plants, if available (these can also be drawn)

Background:

Wildlife habitat team members can pass on the knowledge they have gained about their site by creating a care guide. The guide is for the caretakers of the habitat, whether those caretakers are groundskeepers, other youth and teens, volunteers, or ultimately, a combination of these groups.

The basic sections of the guide include a habitat map, plant list, plant care instructions, and general and seasonal wildlife habitat site maintenance instructions. In addition to providing detailed instructions about caring for the wildlife habitat site, participants can also add their own creative touches to the guide, such as artwork, pictures of plants, before and after photos, a special note to the caretakers and even a dedication page.

***Note**: For a more formal habitat guide, use the same materials but consider having participants type the care instructions and insert graphics into the document.*

What to Do:

1. Divide the participants into groups that correspond to each section of a habitat guide: Habitat Map, Plant List and Plant Care Instructions, General and Seasonal Maintenance, and Cover Design and Acknowledgements. Given that a majority of the information will be contained in the Plant List and Plant Care Instructions section, this group should be the largest. If possible, have volunteers assist small groups.

2. Using field guides, care instructions that accompanied plants, and other related resources, have participants create a section of the Habitat Care Guide using the general guidelines below.

3. After they have completed their sections, have participants present their respective sections of the guide to the whole group. Review the information for accuracy and then, as a group, assemble the guide into a book.

4. Locate a suitable place for the book to be stored, e.g., in the facility library, front desk, in a weather-protected shelter near-by, etc.

5. Create a ceremony of presenting this book to a group leader or administrator for safekeeping and a sense of ownership.

Suggested Care Guide Sections:

Habitat Map:

Ask participants to draw a map of the wildlife habitat site to scale. The map should include which direction is north and any existing paths, buildings, trees and structures that are close the site. Using different colored pencils and symbols, they should mark the location of plants, trees, and shrubs, as well as any pathways, borders, benches, birdhouses or bird feeders. Participants can create a key that deciphers the symbols or they can label the symbols on the map.

Plant List & Plant Care Instructions:
For each plant or flower on the habitat, groups should create a page or two that includes the following:

- **Plant Name:** common name and botanical name.

- **Picture of Plant:** include the plant's leaves and bloom, if possible. Pictures of plants can be drawn, taken from magazines, catalogs, field guides, or the Internet. Small clippings of leaves and/or a petal can be included as well.

Note: Make sure that all plants are well labeled in the habitat site.

- **Description:** include height, spread, type of leaves, flower color and description, and the area to which it is native.

- **Plant Care and Conditions:** a description of the care it needs (watering and pruning) and where it grows best (soil type and sun needs).

General & Seasonal Habitat Maintenance:
Participants will need to provide a description of the general and seasonal maintenance that the habitat site needs. The type of care needed will vary, depending on the region of the country and the plant types found in the wildlife habitat site. Information about these needs is regional. The general description should include a summary of the basic watering, weeding, mulching, and fertilizing (if necessary) that the habitat will need, and when it may need it. This information can be obtained from a nursery or garden center at time of plant purchase or can be obtained from local native plant societies, gardening clubs, or agricultural extension offices.

Depending on the density of the site planting and expectations of the property owners, a wildlife habitat site may become fairly self-sufficient. However, a wildlife habitat maintainer should observe the following important practices:

- Weed the site until plants mature (includes removing any exotic invasive plants in the area if possible).
- Water plants periodically for a full growing season, until they are established.
- Re-apply mulch at least once a year (or as needed) until plants are established. Leave natural leaf- litter where it falls.

Regardless of the region, wildlife habitat sites will go through a dormant period, usually in the winter. A habitat site does not benefit from the traditional practice of removing or cutting back perennials, grasses, fruiting trees, and shrubs in the dormant months. Leave plants standing to provide seeds, fruit, and stems for wildlife that remain in the area. The plants will also provide cover from harsh winter elements. In addition, keep any bird feeders in the habitat filled during this dormant period and provide a clean water source.

Cover Design and Acknowledgements:
Participants can be creative in the design of the wildlife habitat site care guide. Collages, hand-drawn pictures or sketches can adorn the cover, along with a title they create. The acknowledgement page should include the names of all of those who helped create the wildlife habitat, as well as those who donated materials, space, plants, or time to

the project. If appropriate, participants may want to name a specific person or place to whom/which the wildlife habitat site is dedicated.

For Younger Participants (Grades K-4):

Have younger participants create a simplified scrapbook with drawings and pictures of the plants, the work in progress, and the final product. Assist them with labeling their artwork and photos.

Questions:

- How will our habitat site be maintained?
- What information can we pass along to others who may use it?
- How can we best organize and present this information?

Adaptations:

Refer to general adaptations on pages 11-16.

Hearing Disabilities:

- Allow participants who have difficulty speaking to utilize the sign language interpreter for their small group work and making presentations. Encourage all participants to write down comments and questions in their small groups to ensure effective communication.

Learning/Cognitive Disabilities:

- Have simplified versions of resources available as needed, including field guides with large colored pictures.
- Have partners assist participants with reading and writing tasks as needed.
- Have participants who have difficulty writing dictate information for the guide. They can also draw or cut out pictures for the guide.
- If desired, have plant and garden element labels made ahead of time. Consider having participants cut and dry leaves from featured plants for the plant identification section. Have wildlife stickers available to help decorate the guide.

Motor Disabilities:

For participants with limited muscle strength, coordination, or dexterity of the hands:

- Build up the handles of pencils or markers with bandage material or foam as needed. Use large crayons for younger participants.
- Have participants who have difficulty writing dictate information for the guide. They can also draw or cut out pictures for the guide. If desired, have plant and garden element labels made ahead of time. Consider having participants cut and dry leaves from featured plants for the plant identification section. Have wildlife stickers available to help decorate the guide.
- Have adaptive scissors and large glue sticks available.

Visual Disabilities:

Overall:

- If possible, have resources available in alternative formats including large print, Braille, and audio cassette.

For participants with low vision:

- Use large-sized paper to make a large print guide. If possible, have participants complete the text on a computer in 18 or 20-point font.
- Use a scrapbook or large-sized binder to create the project.

For participants who are blind:

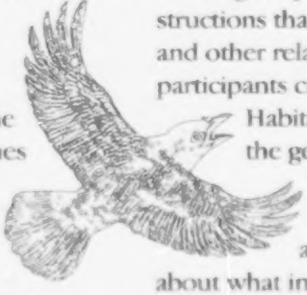
- Use a three-ring binder to create the project. Have participants make section tabs and label them in Braille.
- If possible, have participants create the text on a Braille writer or computer program.
- Have participants cut and dry leaves from featured plants for the plant identification section. If desired, you can cut leaves and flowers out of fabric (e.g., corduroy, felt, etc.) to make a tactile interpretive guide.
- Have participants create the base map in different textures (e.g., rice, beans, fabric, etc.) and label it in Braille.

Creating a Habitat Field Guide

ACTIVITY 45

Background:

A Habitat Field Guide describes the plants and elements of the habitat site and the wildlife it attracts. Similar to creating the Habitat Care Guide (see previous activity), constructing the field guide allows participants to demonstrate what they know about the wildlife habitat site they have created. Once they create the field guide, it then becomes a teaching tool for other youths, teens, and adults who visit the habitat site.



The basic sections of the field guide include a habitat map, a plant list with pictures and descriptions, an overview of wildlife attracted to the habitat, and cover design and acknowledgements. Additional sections may include a dedication page, photos, pages of journal entries from participants about the habitat, wildlife, or nature in general.

Note: For a more formal Habitat Field guide, use the same materials but consider having participants type the care instructions and insert graphics into the document.

What to Do:

1. For the field guide activity, participants can either work as a group on all of the sections of the field guide or you may wish to divide them into teams and give each a specific section to create. The logistics depend upon the size of the group and the amount of time allotted for this activity.

2. Using simple field guides, care instructions that accompanied plants, and other related resources, have participants create a section of the Habitat Field Guide using the general guidelines below. Encourage them to be as creative as possible and think about what information they would want to know if they were coming to this habitat site without having worked on it.

3. Once completed, have participants present their sections of the guide. Review the information for accuracy and then, as a group, assemble the guide.

***Note:** The group can translate the guide onto an audio cassette tape to make an interpretive, self-guided tour of the habitat. This tape can be used by other education groups as well as visitors to the habitat.*

Suggested Field Guide Sections:

Habitat Map:
Ask participants to draw a map of

***Note:** This activity is similar to the Care Guide activity. Consider doing one or the other.*

Summary:

Participants create a field guide for other users of their habitat site.

Grade Level:

5-12

Time:

1-4 hours, depending on the number of plants and elements described in the guide and the number of participants contributing to its creation.

Learning Objectives:

Participants will be able to:

- ◇ Research and identify the specific background information of plants and other elements in a habitat.
- ◇ Create a guide that explains the specific plants, animals, and other elements found in the habitat.
- ◇ Organize and present information clearly.

Materials Needed:

- ◇ White or colored paper
- ◇ Construction paper
- ◇ Glue
- ◇ Scissors
- ◇ Stapler
- ◇ Pens and pencils
- ◇ Colored pencils, markers or crayons
- ◇ Field guides
- ◇ Care instructions that accompanied the plants when purchased
- ◇ Pictures of plants, if available (these can also be drawn)
- ◇ Pictures of wildlife that may be seen in the wildlife habitat site, if available

the wildlife habitat site to scale. The map should include which direction is north and any existing paths, buildings, trees, or other structures that are close to the site. Using different colored pencils and symbols, participants should note where plants, trees, and shrubs are located, as well as any pathways, borders, benches, birdhouses or feeders. They should create a key that deciphers the symbols or label the symbols on the map.

Plant List and Description:
Allow each group to choose specific plants or flowers they would like to write about. For each plant or flower in the habitat, groups should create a page or two that includes the following:

- **Plant Name:** Common name and botanical name.
- **Picture of Plant:** Include the leaves of the plant and bloom, if possible. Pictures of plants can be drawn, from magazines, or copied from field guides.
- **Description:** Include height, type of leaves, flower color and description, aroma (if any), fruit (if applicable), blooming season and whether it is native or not.
- **Regional Information:** Include regions of the country in which it is found.

Wildlife:
For this section, ask participants to write a general overview of the types of wildlife that may be seen in the habitat site. Participants can then add wildlife pictures labeled with the names of the animals. Add which plants or other habitat elements each animal may use for food, shelter, or even a place to raise young.

Cover Design and Acknowledgements:
Participants can be creative in the design of the Habitat Field Guide. Collages, hand-drawn pictures or sketches can adorn the cover, along with a title they create. An acknowledgements page should include the names of all of those who helped create the habitat site, as well as those who donated materials, space, plants, or time to the project. If appropriate, participants may want to name a specific person or place to whom/which the habitat site is dedicated.

Participant Writings About the Habitat:
This optional section is an opportunity for participants to write a poem, a quote, a story, or a journal entry about the site. Participants can express any idea they have regarding the wildlife habitat site, including a description of the site, an animal that visits the site, work participants did on the project, and so on.

For Younger Participants (Grades K-4):

Have younger participants create a simplified scrapbook with drawings and pictures of the plants, the work in progress, and the final product. Assist them with labeling their artwork and photos.

Questions:

- What questions may others have about our habitat?
- How can we present this information to them clearly?

Creating a Habitat Field Guide

ACTIVITY 45

Adaptations:

Refer to general adaptations on pages 11-16.

Hearing Disabilities:

- Allow participants who have difficulty speaking to utilize the sign language interpreter for their small group work and making presentations. Encourage all participants to write down comments and questions in their small groups to ensure effective communication.

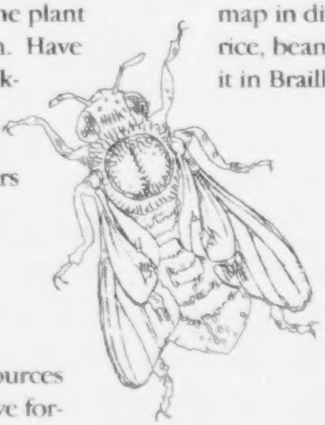
Learning/Cognitive Disabilities:

- Have simplified versions of resources available as needed, including field guides with large colored pictures.
- Have partners assist participants with reading and writing tasks as needed.
- Have participants who have difficulty writing dictate information for the guide. They can also draw or cut out pictures for the guide.
- If desired, have plant and garden element labels made ahead of time. Consider having participants cut and dry leaves from featured plants for the plant identification section. Have wildlife stickers available to help decorate the guide.

Motor Disabilities:

For participants with limited muscle strength, coordination, or dexterity of the hands:

- Build up the handles of pencils or markers with bandage material or foam as needed. Use large crayons for younger participants.
- Have participants who have difficulty writing dictate information for the guide. They can also draw or cut out pictures for the guide. If desired, have plant and garden element labels made ahead of time. Consider having participants cut and dry leaves from featured plants for the plant identification section. Have different wildlife stickers available to help decorate the guide.
- Have adaptive scissors and large glue sticks available.



Visual Disabilities:

Overall:

- If possible, have resources available in alternative formats including large print, Braille, and audio cassette.

For participants with low vision:

- Use large-sized paper to make a large print guide. If possible, have participants complete the text on a computer in at least 18 or 20-point font.
- Use a scrapbook or large-sized binder to create the project.

For participants who are blind:

- Use a three-ring binder to create the project. Have participants make section tabs and label them in Braille.
- If possible, have participants create the text on a Braille writer or computer program.
- Have participants cut and dry leaves from featured plants for the plant identification section. If desired, you can cut leaves and flowers out of fabric (e.g., corduroy, felt, etc.) to make a tactile interpretive guide.
- Have participants create the base map in different textures (e.g., rice, beans, fabric, etc.) and label it in Braille.

Appendices

BEST COPY AVAILABLE

Appendix 1

Environmental Education Resources

Project Resources:

The list below highlights helpful references for Schoolyard Habitats projects. In addition to this listing, resource listings—including books, newsletters, videos, World Wide Web Home Page addresses, resource agencies and organizations—are updated on a regular basis on the NWF Schoolyard Habitats website. Visit us at **http://www.nwf.org/schoolyardhabitats** for information on creating a wildlife habitat on your facility's grounds, and certifying your habitat as an official Schoolyard Habitats site.

NWF Resources:

Habitats
Free newsletter published by NWF. Showcases habitat projects and features articles and ideas relevant to both Schoolyard and Backyard Wildlife Habitats.

Backyard Wildlife Habitat Listserv
Topics discussed usually include tips for creating and maintaining habitats, interesting backyard wildlife sightings, questions relating to attracting wildlife, and more. If you would like to be added to this list, send a blank email to bwh-exchange-subscribe@igc.topica.com.

Teacher Curricula Kits
Classroom resources helping educators introduce environmental issues. Available for the following topics: Habitat, Northern Forest, Smart Growth, Water, Creating Schoolyard Habitats, Wetlands, Wolves, and Endangered Species.

Ranger Rick
Monthly nature magazine for use by grades 4-6. To order: (800) 611-1599.

Ranger Rick's NatureScope
Designed to help K-8 educators incorporate science and environmental education into their teaching through creative activities.

Schoolyard Habitats Listserv
The Schoolyard Habitats listserv allows individuals interested in the creation and use of habitats on school grounds to share ideas. Participants include environmental education experts, resource professionals, teachers, parents, and individuals interested in using the outdoors as a teaching tool. If you would like to be added to this list, send a blank email to syh-exchange-subscribe@igc.topica.com.

Your Big Backyard
Monthly nature magazine for use by grades K-3. To order: (800) 611-1599.

Schoolyard/School Garden Curriculum:

Chedzoy, Sue
Physical Education in the School Grounds
1993, Learning Through Landscapes.
Provides outdoor activities for K-6 that go beyond typical PE curriculum.

Dean, Jacqui
History in the School Grounds
1993, Learning Through Landscapes.
Outdoor activities for K-6 that help students gain a better understanding of history and their school's past.

Hare, R., C. Attenborough and T. Day
Geography in the School Grounds
1993, Learning Through Landscapes.
Outdoor activities for K-6 focusing on geography skills, such as map making, the use of photographs and models, water and land forms, and environmental quality.

Jurenka, Nancy Allen
Beyond the Bean Seed: Gardening Activities for Grades K-6
1996, Libraries Unlimited.
Hands-on activities which integrate gardening and language arts.

Keaney, Brian
Arts in the School Grounds
1993, Learning Through Landscapes.
Numerous creative outdoor art, drama, design, music, and dance activities for K-6.

Keaney, Brian
English in the School Grounds
1993, Learning Through Landscapes.
Activities for K-6 designed to teach students writing, reading, listening, and speaking skills.

Kiefer, Joseph and Martin Kemple
Digging Deeper: Integrating Youth Gardens Into Schools & Communities
1998, Food Works and Common Roots Press.
Takes you step-by-step through the entire process of creating a garden for educational purposes on school grounds. While the focus of the book is vegetable gardens, the information and specific examples are applicable for any type of school garden project.

The Growing Classroom: Garden-Based Science, Grades 2-6
1990, Life Lab.
Resource for teaching math, reading, and nutrition skills. Provides experiments, fun games, and pictures that make learning fun.

Ocone, Lynn and Eve Pranis
National Gardening Association Guide to Kids' Gardening
1990, John Wiley and Sons, Inc.
Information on how to start gardening projects with kids, including a section on garden activities.

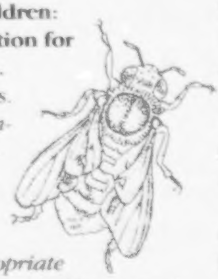
Ocone, Lynn and Eve Pranis
GrowLab: Activities for Growing Minds
1990, National Gardening Association.
Creative plant-related activities for grades K-8.

Appendix 1

Rhydderch-Evans, Zoe
Mathematics in the School Grounds
1993, Learning Through Landscapes.
Activities for K-6 divided into sections on numbers, measurement, space and shape, and data work.

Russell, Helen Ross
Ten Minute Field Trips
1990, National Science Teachers Association.
Hands-on learning K-6 activities to do on school grounds with or without a school garden or wildlife habitat.

Sobel, David
Mapmaking with Children: Sense of Place Education for the Elementary Years.
1998, Heinemann Press.
Provides a developmental perspective on children's understanding of maps, and gives concrete examples of developmentally appropriate mapmaking activities for children ages 5-12. Activities foster students' development of a sense of place, beginning with their own yards and communities.



Thomas, Gill
Science in the School Grounds
1993, Learning Through Landscapes.
Activities for K-6 focusing on ponds, trees, grassed areas, wildflowers, waste-management, mini-beasts, weather, and the built environment.

Magazines/ Newsletters:

Clearing
Bimonthly environmental education resource and activity guide for K-12 teachers and non-formal educators. Focuses on events, resources and activities in Washington, Oregon, British Columbia, Idaho, northern California, and Alaska, but is useful everywhere.

Green Teacher
Fifty page quarterly magazine that provides environmental information and activities for educators of grades K-12.
www.greenteacher.com/

Environmental Education Activities:

Cornell, Joseph
Sharing Nature with Children
1998, Dawn Publications.
Provides activities and insight on ways to involve kids with the outside world.

Environment & Education Habitat and Biodiversity: Teacher Resource Guide
1998, Dale Seymour Publications.
Activities which use the school grounds as a research laboratory for grades 6-12. Topics covered are biodiversity, landscape management, xeriscaping, composting, and integrated pest management.

Hogan, Kathleen
EcoInquiry: A Guide to Ecological Learning Experiences for the Upper Elementary/Middle Grades
1994, Kendall Hunt.

Hunken, Jorie
Ecology for All Ages: Discovering Nature Through Activities for Children and Adults
1994, Globe Pequot Press.

Lingelbach, Jenepher and Purcell, Lisa, eds.
Hands-On Nature: Information and Activities for Exploring the Environment with Children
2000, Vermont Institute of Natural Science.
Well organized and effective nature-based activities.

Parella, Deborah
Project Seasons: Hand-on Activities for Discovering the Wonders of the World
1995, Shelburne Farms.
Elementary activities focused on science through the seasons.

Roberts, Janet Weir and Carol Huelbig.
City Kids and City Critters: Activities for Urban Explorers
1996, Learning Tiger Press.

Tilgner, Linda.
Let's Grow! 72 Gardening Adventures with Children
1988, Story Communications.

WOW! The Wonders of Wetlands: An Educator's Guide.
1995, Environmental Concern.
Background information and 50 activities for grades K-12. Special appendix on creating a schoolyard wetland habitat.

Landscaping for Wildlife:

Druse, Ken and Margaret Roach
The Natural Habitat Garden
1994, Crown Publishing Group.
Information on how to create a beautiful, wildlife-friendly landscape using native plants. Covers many different types of ecosystems (grasslands, drylands, wetlands, woodlands, etc.) and has numerous full color pictures of the recommended plants.

Henderson, Carroll
Landscaping for Wildlife
1994, Minnesota Dept. of Natural Resources.
Guide, reference, and resource book for creating natural landscaping that support wildlife.

Environmental Education Resources (cont.)

Marinelli, Janet, ed.
The Environmental Gardener
1992, Brooklyn Botanic Garden, Inc.

Stein, Sara
Noah's Garden: Restoring the Ecology of Our Own Backyards
1993, Houghton Mifflin.
Inspiring story of the author's experience of transforming her conventional yard into a wildlife haven. Provides practical information on the way ecosystems work.

Wyzga, Marilyn C.
Homes for Wildlife: A Planning Guide for Habitat Enhancement on School Grounds
1998, New Hampshire Fish and Game Department.
Excellent step-by-step guide for creating a schoolyard wildlife habitat and integrating it into the curriculum. Geared toward K-8 teachers. Available through Acorn Naturalist (800) 422-8886.

Landscaping for Children:

The Challenge of the Urban School Site
1996, Learning Through Landscapes.
Instruction and inspiration for creating successful outdoor learning areas at urban schools. Offers practical advice on multi-cultural issues, making use of limited space, seating, shelter, arts, vandalism, and removing asphalt.

Moore, Robin C.
Plants for Play: A Plant Selection Guide for Children's Outdoor Environments
1993, MIG Communications.
Offers suggestions on plants that have educational value and are safe for children.

Moore, Robin C. and Herb H. Wong
Natural Learning: Creating Environments for Rediscovering Nature's Way of Teaching
1997, MIG Communications.
Uses a specific school as a case study to guide teachers, administrators, designers, and parents through naturalizing a schoolyard and integrating it into the curriculum.

Stine, Sharon
Landscapes for Learning: Creating Outdoor Environments for Children and Youth
1997, John Wiley & Sons, Inc.
Provides useful information on what makes a schoolyard habitat successful using 11 case studies and numerous photos and drawings. Also outlines essential elements for any play environment.

Titman, Wendy
Special Places, Special People: The Hidden Curriculum of School Grounds
1994, Learning Through Landscapes.

Wood, Joan and Michael Littlewood
A Guide to the Management and Maintenance of School Grounds
1996, Learning Through Landscapes.

Native Plants:

Beaubaire, Nancy, ed.
Native Perennials: North American Beauties
1996, Brooklyn Botanic Gardens, Inc.
Information on how to include native plants in your garden design and how to care for them. Also provides lists of native wildflowers suppliers.

Marinelli, Janet, ed.
Going Native: Biodiversity in Our Own Backyards
1994, Brooklyn Botanic Gardens.
Suggests native plants to use in your landscape and the benefits of doing so.

Sawyers, Claire, ed.
Gardening with Wildflowers and Native Plants
1990, Brooklyn Botanic Gardens.
Suggests native plants and wildflowers for an attractive wildlife-friendly landscape.

Composting:

Appelhof, Mary
Worms Eat My Garbage: How To Set Up and Maintain a Worm Composting System
1982, Flowerfield Enterprises.

Martin, Deborah L. and Grace Gershuny, eds.
The Rodale Book of Composting
1992, Rodale Press.
Complete information on composting including: history, benefits, methods, equipment, and how-to information.

Soils:

Bowles, John Paul, ed.
Soils
1990, Brooklyn Botanic Garden, Inc.
Information on the properties of soil, plant requirements for soil, how to test your soil, how to improve your soil, and much more.

Water Gardens:

Burrell, C. Colston, ed.
The Natural Water Garden: Pools, Ponds, Marshes & Bogs for Backyards Everywhere
1997, Brooklyn Botanic Garden, Inc.
Helps you select the best type of water garden and plants for your site and region. Offers step-by-step instruction for designing, creating, and installing ponds, marshes, and bogs.

Bats:

Tuttle, Merlin D. and Donna L. Hensley
The Bat House Builder's Handbook
1993, Bat Conservation International.
Excellent information on bats and bat houses.

Appendix 1

Dennis, John
The Complete Guide to Bird Feeding
1994, Alfred A. Knopf.
Information on what birds to expect, when and how to choose the right bird feeder, and how to stock it with the most suitable bird feed.

Butterflies & Hummingbirds:

Dennis, John and Matthew Tekulsky
How to Attract Hummingbirds and Butterflies
1990, Ortho Information Services.
Provides plant selection lists and necessary design elements for the most common species of hummingbirds and butterflies.

Habitat Restoration:

Chesky, Edward D.
Habitat Restoration:
A Guide for Proactive Schools
1993, Waterloo County Board of Education.

Firehook, Karen and Jacqueline Doherty
Citizen's Streambank Restoration Handbook
1995, Izaak Walton League of America.

Riley, Ann L.
Restoring Streams in Cities:
A Guide for Planners, Policymakers and Citizens
1997, Island Press.
Presents land use planning, site design, and watershed restoration techniques that can be used to restore urban streams.

School Greening:

Chase, Jayni and Thomas E. Lovejoy
Blueprint for a Green School
1995, Scholastic Inc.
Very complete guidebook on environmental issues and school grounds. Includes an extensive resource list.

Children's Books:

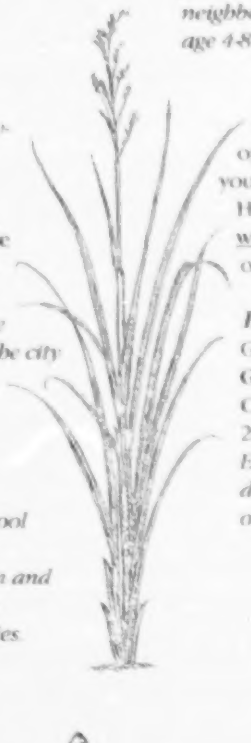
There are thousands of excellent children's books written about plants, animals and the environment. These are a few of the most relevant: how-to habitat guides for children, books that involve children starting successful gardening projects in their neighborhoods, and books in which children are discovering wildlife where they live.

Bash, Barbara
Urban Roosts: Where Birds Nest in the City
1990, Little Brown and Company.
Informative book on urban wildlife for readers ages 9-12.

Bunting, Eve
Secret Place
1996, Clarion Books.
Story of young boy's discovering wildlife in the city.

Herberman, Ethan
The City Kid's Field Guide
1989, Simon and Schuster.
Educational information geared towards kids on the types of wildlife found in the city and how they survive.

Fleischman, Paul
Seedfolks
1997, Harper Collins.
Short novel for middle school students; 9 year-old girl starts a community garden and brings together her diverse neighborhood and its stories.



Perenyi, Constance
Growing Wild: Inviting Wildlife Into Your Yard
1991, Beyond Words Publishing, Inc.
Wildlife habitat creation how-to guide for kids.

Tamar, Erika
The Garden of Happiness
1996, Harcourt Brace and Co.
Mariso, the main character, works with her neighbors to transform a garbage-filled lot in their inner city neighborhood into a community garden. Recommended for readers age 4-8.

Thornhill, Jan
Wild in the City
1995, Sierra Club Books for Children.
Jenny and her mother are surprised to discover all the wild creatures that are living in their urban yard. At the end of the story are details about the animals in the book, as well as hints about how to find clues to their presence in your own neighborhood. Recommended for readers age 4-8.

Grants:

For information about grant opportunities for funding your project, visit the Schoolyard Habitats Program web page: www.nwf.org/schoolyardhabitats or call (800) 822-9199.

Habitat Creation:

Grant, Tim and Gail Littlejohn
Greening Schoolgrounds: Creating Habitats for Learning
2001, New Society Publishers.
Excellent collection of articles addressing many aspects of creating outdoor learning areas.

Environmental Education Resources (cont.)

Wild Ones Landscapers
http://www.forwild.org/
Site is dedicated to the importance of landscaping with native plants. Includes an excellent how-to handbook that guides you through the creation of native plant landscapes and habitat for wildlife.

Sources of Materials:

Acorn Naturalist
http://acorn-group.com
(800) 422-8886
An amazing resource; supplies a huge variety of high quality curricula, field guides, teaching tools and field equipment for teaching in and about the natural world.

Let's Get Growing
http://www.letsgetgrowing.com/
Online catalog full of tools, teaching aides, books, and much more to use with your Schoolyard Habitats site.

Gardens for Growing People
http://www.svn.net/growpepl/
Catalog for ordering child-sized tools, books, curriculum, and much more. The site also offers tips for gardening with children and a free newsletter.

Learning Through Landscapes
http://www.ltl.org.uk/
A UK based program that promotes thoughtful design and use of school grounds. A source for a high quality schoolyard curriculum series as well as guidebooks addressing specific outdoor classroom issues, such as seating, maintenance, and fundraising.

Curriculum and Activities:

The National Gardening Association's Kids Gardening Page
http://www.kidsgardening.com/
Great information for teachers and parents on gardening projects to do with children. Site contains a wealth of information, including recommended books for children and adults, grant opportunities, key word curriculum search, and a free online newsletter.

The Wild Ones
http://www.thewildones.org/
International program that offers curriculum ideas, resource lists, free newsletters, information on research projects that classrooms can join, and much more. Site is also available in Spanish and Portuguese.

Classroom Projects:

Journey North
http://www.learner.org/jnorth/
Free online program through which classrooms can track the spring migration of various animal species. Students share their information with other classrooms across the hemisphere and work directly with scientists. The site also provides lesson ideas and a forum for online teacher discussions.

Classroom Feeder Watch
http://birdsource.cornell.edu/cfw/
Great program run by Cornell University that allows classrooms to participate in ongoing ornithology research projects. Includes curriculum ideas and National Science Education Standards links.

Monarch Watch
http://www.monarchwatch.org/
Site has a great deal of information about teaching about monarchs in the classroom and opportunities for students to participate in research projects with scientists.

American Horticultural Society
http://www.ahs.org/
Plant related information and links to a national list of children's gardens.

The Lady Bird Johnson Wildflower Center
http://www.wildflower.org/
Regional native plant lists, as well as educator kits, which contain plant information and posters for use in the classroom, can be purchased on the site.

Species 2000
http://www.sp2000.org/
Great starting point for learning about specific plant and animal species. Includes in-depth information and a variety of helpful web links.

Butterflies of North America
http://www.npwrc.usgs.gov/resource/distr/lepid/bflyusa/bfly.htm
Excellent source of region-specific information about butterflies, complete with county checklists, distribution maps and photos.

Bat Conservation International
http://www.batcon.org/
Provides information on bats, building bat houses, and ordering bat-related educators' guides.

The Center for Environmental Education
http://www.ceeanc.org/
Contains a searchable database of environmental education programs. Helpful source of topic-specific curriculum and articles and provides curriculum evaluations.

EE-Link
http://eelink.net/
Offers links to many websites, including sites on curriculum ideas, grant opportunities, and environmental education publications.

Appendix 1

ERIC Clearing House for Environmental Education
http://www.ericse.org/eeindex.html
Information on environment-focused books, conferences, lesson plans, journals, and web sites.

School Garden Listserv
A forum for discussing school garden issues. This list is open to all who are interested or participating in school garden creation, use, maintenance and study. Participants discuss issues pertaining to pre-school, elementary, and secondary schools. To subscribe, visit http://www.mallorn.com/mailman/listinfo/school_garden.

Arbour Recycled Products
800 Bank Street
Ottawa, ON K1S3V8
Phone: (613) 567-3168
Vermicomposting (composting with worms) 25-minute video.

Banana Slug String Band
390 Big Creek Road
Davenport, CA 95017
Phone: (408) 429-9806
Cassette tapes and video with sing-along songs about gardening and the environment.

Botanic Garden Seed Company
225 Fifth Avenue, #617
New York, NY 10010
Phone: (212) 679-6015
Seeds and line of supplies for children.

Gardeners' Supply Company
www.gardeners.com/gardeners
128 Intervale Road
Burlington, VT 05401-2850
Phone: (802) 863-1700
Child-sized gardening tools.

Gardens for Growing People
P.O. Box 630
Point Reyes, CA 94956
Phone: (415) 663-9433
http://www.svn.net/growpepl/
Garden supply catalog/newsletter.

Lets Get Growing
www.letsgetgrowing.com
1900 B Commercial Way
Santa Cruz, CA 95065
Phone: (408) 464-1868
Complete selection of children's gardening curriculums; tools and indoor gardening projects.

Northrup-King Lawn and Garden
7500 Olson Memorial Highway
Golder Valley, MN 55427
Phone: (612) 593-7265
Child-sized garden tools, garden supplies.

Wild Birds Unlimited Headquarters
11711 N. College Ave., Suite 146
Carmel, IN 46032-5655
Phone: (888) 302-2473

Appendix 2

Disability-Related Resources

Accessible Gardening Books:

Adil, Janeen
Accessible Gardening for People With Physical Disabilities: A Guide to Methods, Tools, and Plants
1994, Woodbine House, Inc.

Greenstein, Doreen
Backyards and Butterflies: Ways to Include Children with Disabilities in Outdoor Activities
1993, New York State Rural Health and Safety Council.

Rothert, Gene
The Enabling Garden: Creating Barrier-Free Gardens
1994, Taylor Publishing.

Woy, Joann
Accessible Gardening: Tips and Techniques for Seniors and the Disabled
1997, Stackpole Books.

Yeomans, Kathleen
The Able Gardener
1992, Storey Communications.

Accessibility-Related Organizations:

The Access Board
1331 F Street, NW, Suite 1000
Washington, DC 20004-1111
(800) 872-2253
(800) 993-2822 tty
www.access-board.gov/index.htm

National Center on Accessibility
Indiana University
2805 East 10th Street, Suite 190
Bloomington, IN 47408-2698
(812) 856-4422

Smithsonian Accessibility Program
Arts and Industries Building
Room 12[illegible] MRC 426
Washington, DC 20560
(202) 786-2942
(202) 786-2414 tty
http://www.si.edu/resource/access

Outdoor Education Organizations with Inclusive Program Information:

American Camping Association
5000 State Road 67 N.
Martinsville, IN 46151-7902
(765) 342-8456
www.ACAcamps.org

Association of Experiential Education
2305 Canyon Boulevard, Suite 100
Boulder, CO 80302
(303) 440-8844

The American Horticulture Therapy Association
909 York Street
Denver, CO 80206-3799
(303) 331-3862
www.ahta.org

Bradford Woods Outdoor Education Center
5040 S.R. 67 North
Martinsville, IN 46151
(765) 342-2915
www.indiana.edu/~bradwood

Breckenridge Outdoor Education Center
P.O. Box 697
Breckenridge, CO 80424
(970) 453-6422

National Recreation & Park Association
22377 Belmont Ridge Road
Ashburn, VA 20148
[illegible]03) 858-0784
www.activeparks.org/

Wilderness Inquiry
808 14th Avenue SE
Minneapolis, MN 55414
(612) 676-9400
www.wildernessinquiry.org/

Adaptive Equipment:

Ableware *(General)*
Maddak, Inc.
(973) 628-7600
http://www.maddak.com

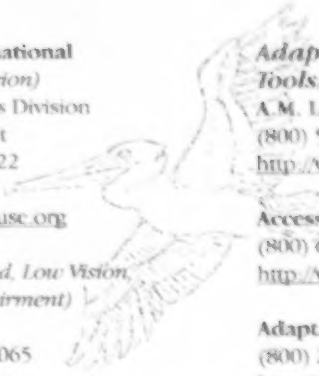
AdaptAbility *(General)*
75 Mill Street
P.O. Box 515
Colchester, CT 06415-0515
(800) 288-9941
http://www.ssww.com

American Printing House for the Blind *(Blind and Low Vision)*
1839 Frankfort Avenue
P.O. Box 6085
Louisville, KY 40206-0085
(800) 223-1839 (Customer Service)
http://www.aph.org

Easier Ways International, Inc.
(Blind and Low Vision)
2954 Shady Lane
Highlands Ranch, CO 80126
(303)290-0987

Independent Living Aids, Inc.
(Blind and Low Vision)
200 Robbins Lane
Jericho, NY 11753
(800) 537-2218
http://www.independentliving.com

Appendix 2



Lighthouse International
(Blind and Low Vision)
Consumer Products Division
111 East 59th Street
New York, NY 10022
(800) 829-0500
http://www.lighthouse.org

LS&S Group *(Blind, Low Vision, and Hearing Impairment)*
P.O. Box 673
Northbrook, IL 60065
(800) 468-4789
(800) 317-8583 tty
http://www.lssgroup.com

Maxi-Aids *(General)*
42 Executive Blvd.
P.O. Box 3209
Farmingdale, NY 11735
(800) 522-6294
(516) 752-0521
http://www.maxiaids.com

Functional Solutions *(General)*
North Coast Medical Consumer Products Division
18305 Sutter Blvd.
Morgan Hill, CA 95037-2845
(800) 235-7054
http://www.ncmedical.com

Access to Recreation, Inc *(General)*
8 Sandra Court
Newbury Park, CA 91320-4302
(800) 634-4351
http://www.accesstr.com

Smith & Nephew, Inc. *(General)*
One Quality Drive
P.O. Box 1005
Germantown, WI 53022-8205
(800) 558-8633
(414) 251-7840

Adaptive Gardening Tools/Equipment:

A.M. Leonard, Inc.
(800) 543-8955
http://www.amleo.com

Access to Recreation, Inc.
(800) 634-4351
http://www.accesstr.com

AdaptAbility
(800) 288-9941
http://snww.com

Gardeners Supply Co.
(800) 444-6417
http://gardeners.com

Kinsman Company
(800)733-4146
http://www.kinsmangarden.com

Lagenbach
(800) 362-1991
http://www.lagenbach.com

Disability Groups:

Amputation:

American Amputee Foundation, Inc.
P.O. Box 250218
Little Rock, AR 72225
(501) 666-2523

National Amputee Foundation
73 Church Street
Malverne, NY 11565
(516) 887-3600

Aphasia:

National Aphasia Association
P.O. Box 1887
Murray Hill Station
New York, NY 10156-0611
(800) 922-4622
(212) 263-7929
http://www.aphasia.org/

Autism:

Autism Society of America
7910 Woodmont Ave., Suite 650
Bethesda, MD 20814-3015
(800) 328-8476
http://www.autism-society.org/

Blind/Low Vision:

American Council of the Blind
1155 15th Street, NW, Suite 720
Washington, DC 20005
(202) 467-5081
(800) 424-8666
info@acb.org

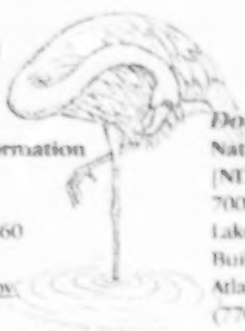
Lighthouse International
111 East 59th Street
New York, NY 10022
(800) 829-0500
(212) 821-9200
(212) 821-9713 tty
http://www.lighthouse.org

Cerebral Palsy:

United Cerebral Palsy Association
1660 L St., NW, Suite 700
Washington, DC 20036-5603
(800) 872-5827
(202) 776-0406
(202) 973-7197 tty
ucpnatl@ucpa.org

Appendix 2

Disability-Related Resources (cont.)



Attention Deficit Disorder:

Children with Attention Deficit Disorder (C.H.A.D.D.)
8181 Professional Place, Suite 201
Landover, MD 20785
(301) 306-7070
(800) 233-4050
http://www.chadd.org/

Epilespsy:

Epilepsy Education Association, Inc.
1025 Creekside Court, Apt. C
Mishawaka, IN 46544
(219) 273 - 4050
http://www.iupui.edu/~epilepsy

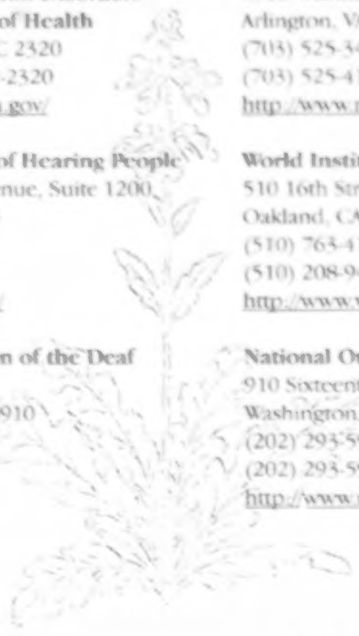
Deaf/Hard of Hearing:

Laurent Clerc National Deaf Education Center
Gallaudet University
800 Florida Avenue, NE
Washington, DC 20002
(202) 651-5340 tty

National Institute on Deafness and Other Communication Disorders National Institutes of Health
31 Center Drive, MSC 2320
Bethesda, MD 20892-2320
http://www.nidcd.nih.gov/

Self-Help for Hard of Hearing People
7910 Woodmont Avenue, Suite 1200
Bethesda, MD 20814
(301) 657-2248
(301) 657-2249 tty
http://www.shhh.org/

National Association of the Deaf
814 Thayer Avenue
Silver Spring, MD 20910
(301) 587-5996
(301) 587-1789 tty



Diabetes:

National Diabetes Information Clearinghouse
1 Information Way
Bethesda, MD 20892-3560
(301) 654-3327
http://www.niddk.nih.gov/

American Diabetes Association (ADA)
1660 Duke Street
Alexandria, VA 22314
(703) 549-1500
(800) 232-3472
http://www.diabetes.org/custom.asp

General:

Easter Seals
230 West Monroe Street, Suite 1800
Chicago, IL 60606
(800) 221-6827
(312) 726-6200
(312) 726-4258 tty
http://www.easter-seals.org/

National Council on Independent Living
1916 Wilson Boulevard, Suite 209
Arlington, VA 22201
(703) 525-3406
(703) 525-4153 tty
http://www.ncil.org

World Institute on Disability
510 16th Street, Suite 100
Oakland, CA 94612
(510) 763-4100
(510) 208-9496 tty
http://www.wid.org/index.htm

National Organization on Disabilities
910 Sixteenth St., NW, Suite 600
Washington, DC 20006
(202) 293-5960
(202) 293-5968 tty
http://www.nod.org/index.html

Down Syndrome:

National Down Syndrome Congress [NDSC]
7000 Peachtree-Dunwoody Road, NE
Lake Ridge 400 Office Park
Building 5, Suite 100
Atlanta, GA 30328
(770) 604-9500
(800) 232-6372
http://members.carol.net/~ndsc/

National Down Syndrome Society (NDSS)
666 Broadway
New York, NY 10012-2317
(212) 460-9330
(800) 221-4602
http://www.ndss.org/

Learning Disabilities:

Learning Disabilities Association of America
4156 Library Road
Pittsburgh, PA 15234
(412) 341-8077

Schwab Foundation for Learning
1650 South Amphlett Boulevard, Suite 300
San Mateo, CA 94402
(800) 230-0988
(650) 655-2410
http://www.schwablearning.org/index.html

Orton Dyslexia Society
8600 La Salle Road,
Chester Building, Suite 382
Baltimore, MD 21286-2044
(410) 296-0232
(800) 222-3123
ods@pie.org

Appendix 2

Multiple Sclerosis:
Multiple Sclerosis
733 Third Avenue
New York, NY 10017
(800) 344-4867
http://www.nmss.org/

Muscular Dystrophy:
Muscular Dystrophy Association
3300 East Sunrise Drive
Tucson, AZ 85718
(520) 529-2000
(520) 529-5300
mda@mdausa.org

Mental Retardation:
The Arc of the United States
1010 Wayne Avenue, Suite 650
Silver Spring, MD 20910
(301) 565-3842
info@thearc.org

American Association on Mental Retardation
1719 Kalorama Road, NW
Washington, DC 20009
(202) 387-1968

Spina Bifida:
Spina Bifida Association of America
4590 MacArthur Boulevard, NW
Suite 250
Washington DC 20007- 4226
(202) 944-3285
(800) 621-3141
sbaa@sbaa.org

Spinal Cord Injury:
American Spinal Injury Association
345 East Superior Street, Room 1436
Chicago, IL 60611
(312) 238-1242
http://www.asia-spinalinjury.org/

National Spinal Cord Injury Association (NSCIA)
8701 Georgia Avenue, Suite 500
Silver Spring, MD 20851
(301) 588-6959
http://www.spinalcord.org/

Appendix 3

National Science Education Standards Alignment Chart

	Have to Have a Habitat	Habitat Web	Designing Wildlife Habitats	Nature Scavenger Hunt	Habitats for Sale	Wildlife Observation Hike	Photosynthesis Phun	Taking Earth's Temperature	A Field, A Forest, and a Stream	Sand, Silt, and Clay	Compost Crazy	Making a Model Streambed	Water Cycle	Water, Water, Everywhere?	Watershed Where You Live	Build a Tree	Tree Detectives!	Flower Power	Build Your Own Flower	Flower Hunt
Science as Inquiry				X		X	X	X	X	X	X	X			X					
Structure and Function																X	X	X	X	
Reproduction and Heredity																		X	X	
Regulation and Behavior							X	X			X									
Diversity and Adaptations	X	X		X		X											X		X	X
Populations and Ecosystems	X	X	X	X	X	X									X					
Technological Design											X				X					
Understanding about Science/Technology											X									
Populations, Resources, Environ.	X	X	X	X		X								X	X					
Risks and Benefits																				
Science/Technology in Society														X						
Science as a Human Endeavor				X																
Nature of Science	X					X	X	X	X	X	X	X	X				X	X		
Properties and Changes									X	X	X	X	X		X					

Appendix 3

Acting Like Animals	An Unnatural Trail	Animal Homes Hike	Local Wildlife	Habitat Hunt	Woodland Chase	Bird Behavior Hike	Building Birdhouses & Feeders	Spider Sensations	Small Seek	Stop! Erosion!	Deadly Links	Habitat Shrink	What to Do with an Empty Lot	Career Day	Ask the Expert	Pledge of Action	Site Mapping	Dream Habitat	Site Design	Plant Selection	Breaking New Ground	Planting Your Habitat Site	Creating a Habitat Care Guide	Creating a Habitat Field Guide
						X											X		X					
							X	X																
																				X				
		X			X	X																		
X	X	X						X																
		X	X	X	X				X				X				X	X	X	X				
									X							X		X			X	X	X	X
										X	X					X					X			
			X							X	X	X	X			X	X	X				X	X	X
											X	X	X	X	X	X			X					
											X		X	X	X	X		X	X		X	X		
														X	X	X	X				X			
				X		X			X					X	X		X				X		X	X
										X							X				X			

Sensory Garden Native Plant List

Botanical Name	**Common Name**	**Sensory Aspect**	**Region**
Abies balsamea	Balsam fir	Aromatic	NE, MA
Aesculus pavia	Red buckeye	5-fingered palmate leaves are like tiny umbrellas; 3-chambered seed pods	SE, SW
Anemone cylindrica	Windflower	Silky, hairy stems; soft, fluffy seed heads	MW, SW
Artemisia tridentata	Tall sagebrush	Aromatic, fine-textured, gray-green foliage	NW, RM
Asarum canadense	Canada wild ginger	Velvety, heart-shaped leaves	MA, MW, NE, SE
Balsamorhiza sagittata	Balsamroot	Arrowhead shaped leaves	NW, RM
Bouteloua curtipendula	Sideoats grama	Texture	MA, MW, RM, SW
Callicarpa americana	American beautyberry	Bead-like berries	SE, SW
Calocedrus decurrens	Incense cedar	Wood is aromatic	CA, NW
Carya tomentosa	Mockernut hickory	Aromatic foliage	SW
Ceanothus integerrimus	Deerbrush	Fragrant white flowers	NW
Cephalanthus occidentalis	Buttonbush	Curious, fragrant, white balls of bloom	MA, MW, NE, SE, SW
Cercis canadensis	Redbud	Heart-shaped leaves	MA, MW, SE, SW
Chamaecyparis nootkatensis	Yellow cedar	Scale-like needles	AK, NW
Chasmanthium latifolium	River oats, Northern sea oats	Showy, flat seed heads that rattle and flitter in the breeze	MA, SE, SW
Chionanthus virginicus	Fringe tree	Aromatic white flowers	MA, SE, SW
Clematis ligusticifolia	Clematis	Clustered white flowers which become fluffy balls	CA, NW, RM, SW
Clethra alnifolia	Dwarf sweet pepperbush	Delightful, fragrant white racemes (var. 'Hummingbird')	MA, NE, SE
Cupressus arizonica	Arizona cypress	Aromatic blue-green foliage	SW
Dicentra formosa	Bleeding heart	Locket-shaped flowers	CA, NW
Dryas octopetala	Mountain avens	Small, scalloped green leaves; tufted seed pods	AK, NW, RM
Echinacea pallida	Pale purple coneflower	Lance-shaped leaves	MW, SE, SW
Echinacea purpurea	Purple coneflower	Spiky coneflower head	MA, MW, SE, SW
Elaeagnus commutata	Wolf willow, silver berry	Lustrous coating of silvery scales and fragrant yellow flowers	AK, RM
Elymus canadensis	Canada wild rye	Texture	MA, MW, NE, NW, RM, SW
Eriophyllum lanatum	Oregon sunshine	Dense covering of white hairs on the leaves	CA, NW, RM, SW
Eryngium yuccafolium	Rattlesnake master	Spiky, yucca-like foliage is topped in July and August with 3' stems of white, prickly balls	MA, MW, SE, SW
Eupatorium havanense	Mistflower, white boneset	Fragrant white flowers	SW
Fothergilla major	Witch alder	Faintly fragrant, white flowers	SE
Gaultheria procumbens	Wintergreen	Aromatic	MA, NE
Hibiscus coccineus	Red rose mallow	Palmately divided leaves	SE
Ilex verticillata	Winterberry holly	Grayish bark and smooth twigs	MA, MW, SE, SW
Illicium floridanum	Purple anise, Florida anise	Leathery leaves, emit a licorice scent when crushed; star-shaped seed pods	SE
Itea virginica	Virginia sweetspire	Fragrant white flower spires	SE, SW
Juncus effusus	Corkscrew rush	Spirals on spirals wind in and through each other on thin, flexible, round, leafless stems.	MA, SE, SW
Juniperus virginiana	Virginia cedarwood, Red cedar	Aromatic	MA, MW, SW
Ledum groenlandicum	Labrador tea	Aromatic white flowers	AK, NE, NW
Leucothoe axillaries	Coast leucothoe, Dog hobble	Lightly-fragrant, bell-shaped flowers	SE
Liatris aspera	Rough gayfeather	Texture	MA, MW
Liatris spicata	Gayfeather Marsh blazing star	Texture	MA, SE
Liatris squarrosa	Southern blazing star	Texture	SE, SW
Lonicera sempervirens	Coral honeysuckle	Smooth, round opposite leaves surround and pierce the stems	MA, NE, SE, SW

BEST COPY AVAILABLE

Appendix 4

Botanical Name	Common Name	Sensory Aspect	Region
Lysichiton americanum	Skunk cabbage	Rancid-smelling plant	NW
Magnolia virginiana var. australis	Evergreen sweetbay magnolia	Lemon-scented blossoms	MA, SE, SW
Monarda didyma	Oswego tea	Aromatic leaves	MA
Monarda fistulosa	Wild bergamot	Leaves are pleasantly aromatic	MA, MW, NE, RM, SE, SW
Muhlenbergia capillaris	Hairy awn muhly, Gulf muhly	Narrow green foliage has nice texture	SE, SW
Muhlenbergia rigens	Meadow muhly	Texture	CA
Osmunda cinnamomea	Cinnamon fern	Texture	MA, MW, NE, SE, SW
Panicum virgatum	Switchgrass	Texture	MA, MW, NE, RM, SE, SW
Penstemon fruticosus	Shrubby penstemon	Toothed, glossy leaves	NW, RM
Philadelphus lewisii	Wild mock orange	Beautifully fragrant, large white flowers, smell like oranges	NW, RM
Phlox divaricata	Woodland phlox	Fragrant icy blue flowers (var. 'Clouds of Perfume')	MA
Phlox paniculata	White garden phlox	Fragrant flowers (var. 'David')	MA
Picea glauca	White spruce	Aromatic	NE
Picea mariana	Black spruce	Aromatic	AK, MW, NE
Polystichum acrostichoides	Christmas fern	Texture	MA, MW, NE, SE, SW
Quercus alba	White oak	Shaggy bar	MA, MW, NE, SE, SW
Rhododendron atlanticum	Dwarf or coastal azalea	Fragrant blooms	SE
Rhododendron austrinum	Florida flame azalea	Fragrant yellow blossoms	SE
Rhododendron canescens	Piedmont azalea	Blooms appear in early April with a delicate, sweet fragrance	SE, SW
Rhododendron viscosum	Swamp azalea	Aromatic white flowers	MA, SE
Rhus lanceolata	Flameleaf sumac	Red fruit has citrusy taste	SW
Rhus typhina	Staghorn sumac	Soft, velvet twigs	MW, NE
Rudbeckia fulgida var. sullivantii	Black-eyed Susan	Texture; hairy stems	MA, SE
Rudbeckia grandiflora	Black-eyed Susan	Texture; hairy stems	SW
Rudbeckia subtomentosa	Sweet black-eyed Susan	Rough, scratchy leaves	MW
Salvia greggii	Texas sage	Aromatic foliage	SW
Salvia lyrata	Purple lyreleaf sage	Walking through the dry seed stalks sounds like walking through rattlesnakes	SW
Sassafras albidum	Sassafras	Green, aromatic twigs	MA, NE, SE, SW
Schizachyrium scoparium	Little bluestem	Texture	MA, MW, NE, RM, SE, SW
Senecio aureus	Golden ragwort	Scalloped, kidney-shaped leaves	MA, NE, SE
Solidago caesia	Bluestem goldenrod	Texture	MA, NE, SE
Solidago odora	Sweet goldenrod	Fragrant, licorice-scented foliage	SE
Sophora secundiflora	Texas mountain laurel	Fragrant purple flowers	SW
Sorghastrum nutans	Indiangrass	Texture	MA, MW, NE, SE, SW
Stylophorum diphyllum	Celandine poppy	Unusual hairy seedpods	MA
Thermopsis villosa	Carolina lupine, bush pea	Long-lasting flat seed pods atop hairy seeds	SE
Thuja accidentails	American or eastern white cedar	Aromatic	MW, NE
Tsuga canadensis	Canadian or eastern hemlock	Aromatic	MA, MW, NE, SE
Tsuga caroliniana	Carolina hemlock	Aromatic	SE
Tsuga heterophylla	Western hemlock	Aromatic	AK, NW
Tsuga mertensiana	Mountain hemlock	Aromatic	AK, NW, RM
Umbellularia californica	California bay laurel	When crushed, the foliage, twigs and other parts are pungently aromatic	CA, NW
Viburnum prunifolium	Black haw	Texture from extremely scaly light brown bark	MW, SE, SW
Zizia aurea	Golden alexanders	Divided toothed leaflets yield flat topped umbels	MW, NE, SW

Sensory Plant Key

Alaska (AK)
California (CA) both Northern & Southern California
Mid-Atlantic (MA) includes DC, DE, KY, MD, NJ, OH, PA, VA, WV
Midwest (MW) includes IA, IL, IN, KS, MI, MN, MO, ND, NE, SD, WI
Northeast (NE) includes CT, MA, ME, NH, NY, RI, VT
Northwest (NW) includes OR, WA
Rocky Mountain (RM) includes CO, ID, MT, NV, UT, WY
Southeast (SE) includes AL, AR, FL, GA, LA, MS, NC, SC, TN
Southwest (SW) includes AZ, NM, OK, TX

BEST COPY AVAILABLE

Appendix 5

Sighted Guide Technique

Overview:

Sighted guide technique refers to a method by which a visually impaired person and a sighted person can walk together safely and comfortably. Specific techniques and movements are prescribed to allow the pair to negotiate a variety of travel situations safely, comfortably, and efficiently.

The person who is visually impaired may be someone with partial sight or no sight. Many people who have reduced vision can move independently for the majority of the time but may need assistance in dark or unfamiliar areas.

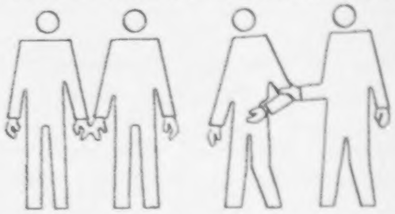
Sighted guide technique requires a minimal amount of practice to master; however, it does require some time and effort. Once you are at ease with the techniques you will be able to negotiate most areas without interrupting your conversation and without unnecessary verbal directions. The experienced follower will be able to teach a novice guide quickly and the experienced guide will be able to guide most visually impaired people with comfort.

Note: *Throughout these instructions the sighted person will be referred to as the guide and the visually impaired person will be referred to as the follower.*

Contact and Grasp:

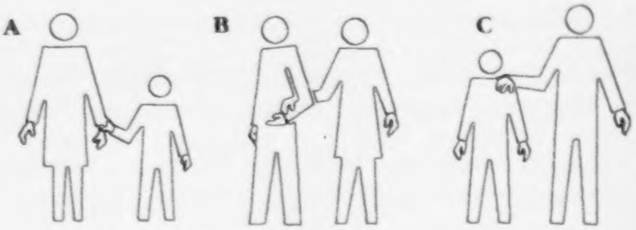
GUIDE: Touch the follower's elbow, forearm, or hand with the back of your hand.

FOLLOWER: Grasp the guide's arm above the elbow with your fingers on the inside of the arm near the guide's body and your thumb on the outside near you. Use a firm grasp but do not use excessive pressure.



Alternative Grasps

When the follower is:
A. a child.
FOLLOWER: Grasp the guide's wrist.
B. in need of some physical support.
GUIDE: Bend your arm at the elbow.
C. much taller than the guide.
FOLLOWER: Rest your hand on the guide's shoulder.

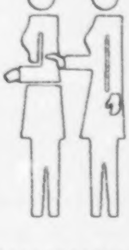


Stance:

GUIDE: Stand with your arm relaxed at your side or bent at the elbow.

FOLLOWER: Your arm should be bent at the elbow, placing you a half step behind the guide. Keeping the elbow bent for long periods of time can be uncomfortable for the guide. Experienced guides and followers can often times travel just as well with the guide's hand dropped to a vertical position.

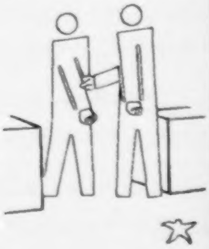
Note: *Walk at a pace that is comfortable for both people. The guide should not be "dragging or towing" the follower and the follower should not be pushing the guide.*



Narrow Passage:

GUIDE: Continue facing forward, move your arm diagonally across your back.

FOLLOWER: Straighten out your arm and move directly behind the guide thus following effectively in single file.

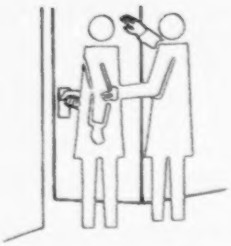


Appendix 5

Doors:

GUIDE: Tell the follower if the door needs to be pushed or pulled and whose side the hinges are on. Begin opening the door. Let the follower hold the door if indicated. A simple statement such as, "Your door," will alert the follower as to the need for an appropriate action.

FOLLOWER: If the hinges are on your side, maintain your grasp while supporting the door for yourself. If the hinges are on the guide's side, place your free hand above your original grasp as if you are beginning to change sides. Brace the door with your (newly) freed hand. When you have passed through the door, reverse this process and assume your original grasp.

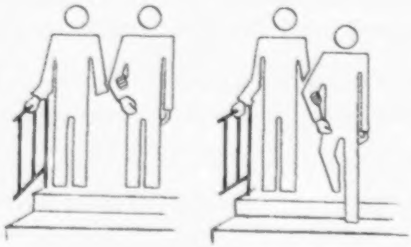


Stairs:

GUIDE: Stop just before the stairs. Tell the follower if the stairs go up or down. Allow the follower to use the handrail if possible. Move your arm forward, bringing the follower to the edge of the stairs. The follower will be beside you. Step onto the first step ahead of the follower. Stop at the end of the stairs. Tell the follower that you are at the end.

FOLLOWER: Bring your toes to the edge of the stairs. Start a full step after the guide.

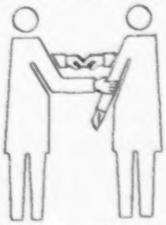
Note: With time and experience both the guide and the follower will become comfortable with a brief pause instead of full stops and with a minimum of verbal directions. A simple statement such as, "stairs down or stairs up," will suffice.



Turning Around About Face: (to turn in a small space, or to avoid confusing the follower)

GUIDE: Ask the follower to "about face." Turn in to face the follower. Offer your other arm. Complete the turn once the follower has grasped your arm.

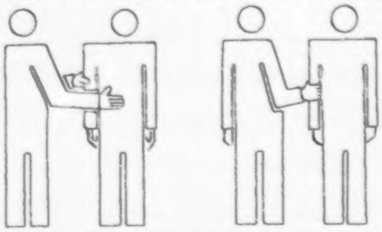
FOLLOWER: Face the guide. Contact the guide's other arm. Release your original grasp. Assume the normal grasp on the new arm.



Changing Sides: (before stairs or to avoid an obstacle)

GUIDE: Ask the follower to change sides. Bring your arm behind you.

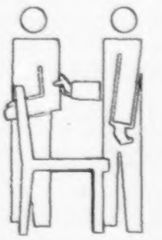
FOLLOWER: Grasp the guide's arm with your free hand above your other hand. Release your original grasp and slide that hand across the guide's back to the free arm. Bring your second hand across to the guide's other arm. Assume the normal grasp position.



Sitting:

GUIDE: Position the follower in, so that the follower's knees touch the front of the chair. For some followers it may be helpful to describe the back and arms of the chair.

FOLLOWER: Bend to the chair, sweep the seat with one hand, locate the arms and sit.



Reprinted with permission from Hoover Services, Baltimore, MD.

Appendix 6

Top Ten Rules for Communicating with People with Disabilities

1. When talking with a person with a disability, speak directly to that person rather than through a companion or sign language interpreter.

2. When introduced to a person with a disability, it is appropriate to offer to shake hands. People with limited hand use or who wear an artificial limb can usually shake hands.

3. When meeting a person with a visual impairment, always identify yourself and others who may be with you.

4. If you offer assistance, wait until the offer is accepted. Then listen to or ask for instructions.

5. Treat adults as adults. Address people who have disabilities by their first names only when extending that same familiarity to all others present.

6. Leaning or hanging on a person's wheelchair is similar to leaning or hanging on a person and is generally considered annoying.

7. Listen attentively when you're talking with a person who has difficulty speaking. Be patient and wait for the person to finish, rather than correcting or speaking for the person.

8. When speaking with a person in a wheelchair, place yourself at eye level in front of the person to facilitate the conversation.

9. To get the attention of a person who is hearing impaired, tap the person on the shoulder or wave your hand. Look directly at the person and speak clearly, slowly, and expressively to establish if the person can read your lips.

10. Relax. Don't be embarrassed if you happen to use accepted, common expressions, such as, "See you later," or "Did you hear about this," that seem to relate to the person's disability.

Reprinted with permission from The Inclusion Network's web site: www.inclusion/org

Access Nature Evaluation Form

In order for us to produce the most accurate, effective, and user-friendly product, we need your feedback. Please let us know what you think of this curriculum. Once you have completed this form, please return all comments to the address below. PLEASE FEEL FREE TO USE SEPARATE PAGES TO ANSWER QUESTIONS OR ADD ADDITIONAL COMMENTS. Be as specific as possible. Thanks so much for your time and assistance!

Your Name(Optional):

Address: Phone: Email:

General:

1. Overall, how effective is this curriculum in preparing the educator to teach the activities? Are there any changes you might suggest?

Activity Specific:

1. How accurate/appropriate is the background material for each activity? Please point out inaccurate background information, or anything that does not meet the needs of the instructor.

2. How applicable are the activities to habitats throughout the region? Please comment on any activities that may not be appropriate to a particular region and suggest alternatives, if possible.

3. How do the objectives fit with each activity? Please indicate any objectives that you found unclear, or note where any may need to be added.

4. How well do the activities reflect the grade level range they have indicated? Please point out activities that need to be reassessed in this regard.

5. How stimulating and/or educationally sound are the activities? Please note any activities that need modifications. How might we change the activity?

6. How useful were the adaptations for each activity? Do you have any additional suggestions?

Other comments:

Please return to: Access Nature, National Wildlife Federation, 11100 Wildlife Center Drive, Reston, VA 20190-5362

schoolyard habitats.
NATIONAL WILDLIFE FEDERATION®

Application for Certification

Office Use:
Habitat # ______
Date Received ______
Certified ______
C.S. ______
Key Words ______
Source Code ______

School/Learning Center Name ______
Principal/Director ______
Contact Name (if different) ______
Address ______
City ______
State/Province ______ County ______ Zip/Postal Code ______
School Telephone ______ Contact Telephone (if different) ______
Fax ______ Contact E-mail Address ______
Would you like to be added to the Schoolyard Habitats listserv? ☐ *Yes* ☐ *No*
School Website Address ______ *Does your website feature your SYH project?* ☐ *Yes* ☐ *No*
Would you like your Schoolyard Habitats site featured on the NWF website? ☐ *Yes* ☐ *No*
Grade Level(s) Served by School/Learning Center: ______
Ages of Students Actively Involved in SYH Project: ______
Size (Sq. Ft. or Acres) of SYH Project Site: ______
How did you hear about the Schoolyard Habitats program? ______

A Schoolyard Habitats project can be an incredible addition to your school campus and local community for many years to come. After reading the Schoolyard Habitats Planning Guide, please complete all five sections of this application, showing the steps you have taken to create the habitat area and how it is used as a learning site. Incomplete applications may not be accepted. For assistance with the application, contact the SYH Program Staff at wildlife@nwf.org or call 1-800-822-9919.

I) Project Description/Goals

Please briefly describe current projects and future goals for the Schoolyard Habitats site. Include the process that occurred during the development of your habitat and the educational objectives of this project.

I) Habitat Team Structure

The team should represent a variety of people (i.e. not all team members should be teachers). List the key participants involved with the habitat project and the segment of the school community they represent.

Team Member Name:	Representing:

III) Habitat Components

Locally native plants provide the widest range of seasonal habitat benefits to wildlife. If we want not only to attract wildlife, but to help restore the diversity of our local ecosystems, we must bring back our locally native plants. The National Wildlife Federation strongly encourages the use of native plants.

FOOD: *Plantings and Feeders*

Food is best provided for wildlife naturally (nuts, nectar, berries, pollen, and buds). The best source of naturally occurring food is found in plants native to your region. Care should also be taken to provide year-round food sources for local wildlife. Briefly list the food available for wildlife at your site, if it is provided naturally or as a supplement, and if it is provided through native plants. Discovering which plants are native is an important part of the learning process in Schoolyard Habitats work. If you are unsure whether the plants on your schoolyard are native, involve your students and Habitat Team in research to find out!

			This plant is native:	
Food Type:	Provided By:	Visited By:	Yes	No
ex: berries	*Cotoneaster*	*Hermit Thrushes, Robins, & Bluebirds*	☒	☐
			☐	☐
			☐	☐
			☐	☐
			☐	☐
			☐	☐

WATER: *Drinking, Bathing*

Wildlife needs water daily and throughout the year. An elevated birdbath may protect birds from cats and other predators, while a shallow, wide-rimmed dish will provide water for small animals when placed on the ground near shrubbery or other cover. A small pond set into the ground can provide not only water for drinking and bathing, but cover and reproductive areas for small fish, frogs, insects and reptiles.

We provide water: ☐ Throughout the Year ☐ Seasonally

We provide water in: ☐ Bird Bath ☐ Pond

☐ Spring ☐ Water Garden

☐ Water Dripping into a Bird Bath ☐ Stream

☐ Other (describe): ______________________

BEST COPY AVAILABLE

C. COVER: *Places to Hide*

The ideal wildlife habitat area will include plants ranging in size and density from evergreen ground cover to tall, mature trees. This variety of plant life will assist a range of animals in selecting the appropriate cover they need for feeding, hiding, courting and nesting. Hollow logs, brush piles, and stone walls can add to the range of cover you provide.

We provide cover for wildlife in the following manner:

Deciduous Shrubs/Trees:	Number	Evergreen Shrubs/Trees:	Number:

☐ Brush Piles ☐ Log Piles ☐ Rock Piles/Walls ☐ Ground Covers

☐ Meadow, Scrub, or Prairie Patch ☐ Other (describe): ____________________

____

D. PLACES TO RAISE YOUNG

A more specific kind of cover is needed to make your wildlife habitat complete. These are areas for courtship and for nurturing young animals and include safe areas for nests, specific plants upon which butterfly caterpillars depend, and the shallow water security that tadpoles find in a pond.

We provide the following for nesting birds, denning mammals, egg-laying reptiles and amphibians, fish, butterflies, and other insects and invertebrates:

Large Trees:	Small Trees:	Shrub Masses:

☐ Trees with Nest/Den Cavities ☐ Dens in Ground/Rock

☐ Water Garden/Pond ☐ Nesting Boxes

☐ Nesting Shelves ☐ Meadow, Prairie, or Scrub Patch

☐ Other (describe): ____________________

____

IV) Site Diagram and Project Documentation

Please enclose a sketch or landscape design on 8.5" x 11" paper to visually explain the components of your Schoolyard Habitats site. Please make note of which elements are currently in place, and which will be added in the future. Indicate any features created to make the habitat accessible to students with disabilities (i.e. pathways, raised planting beds, etc.). We are unable to return all materials; please keep a duplicate copy for your records.

We encourage you to send before and after photos of your Schoolyard Habitats site, as well as photos which demonstrate student and community involvement with the project. Please label all photos with your school name, city, state, and approximate dates when the photos were taken. All photos must be accompanied by a release form. Please download a copy of the release form from our website (or contact our office to request a copy if you plan to include photos with your application). We are unable to return materials sent to us, so please be sure to keep duplicates for your records.

V) Widening the Classroom Walls: *Curriculum Use*

Please submit additional pages as needed.

A. Describe how you are using your Schoolyard Habitats site for cross-curriculum learning. How do you meet state/local benchmarks and standards of learning through use of your habitat site?

B. How many teachers at your school are currently using the Schoolyard Habitats site as an educational tool?

C. What steps have you taken or do you plan to take in order to increase the usage (by students and teachers) of your Schoolyard Habitats site?

D. Have educators at your school written up lessons or curriculum for use in the Schoolyard Habitats site or to accompany the project? Please describe.

E. What resources have been helpful in the planning and instructional use of your Schoolyard Habitats project (e.g., Project Wild, Project Learning Tree, NAAEE's VINE program)?

F. What other types of resources would be useful to the future development and use of your Schoolyard Habitats site?

VI) Maintenance

Briefly describe your maintenance plan, both during the school year, as well as during the summer months.

***Thank you* for your interest and participation in the Schoolyard Habitats Program.**
Please:

- Allow 6-8 weeks for processing of the application.
- Be sure to save copies of all materials you submit as they will not be returned.
- **Please submit this application with the $15 Program Enrollment Fee to cover our processing and handling costs.**
- If submitting photos, please enclose a photo release form (see IV. Site Diagram and Project Documentation).
- All submissions must be sent together in one 9" x 12" envelope.

Please send your submission to:

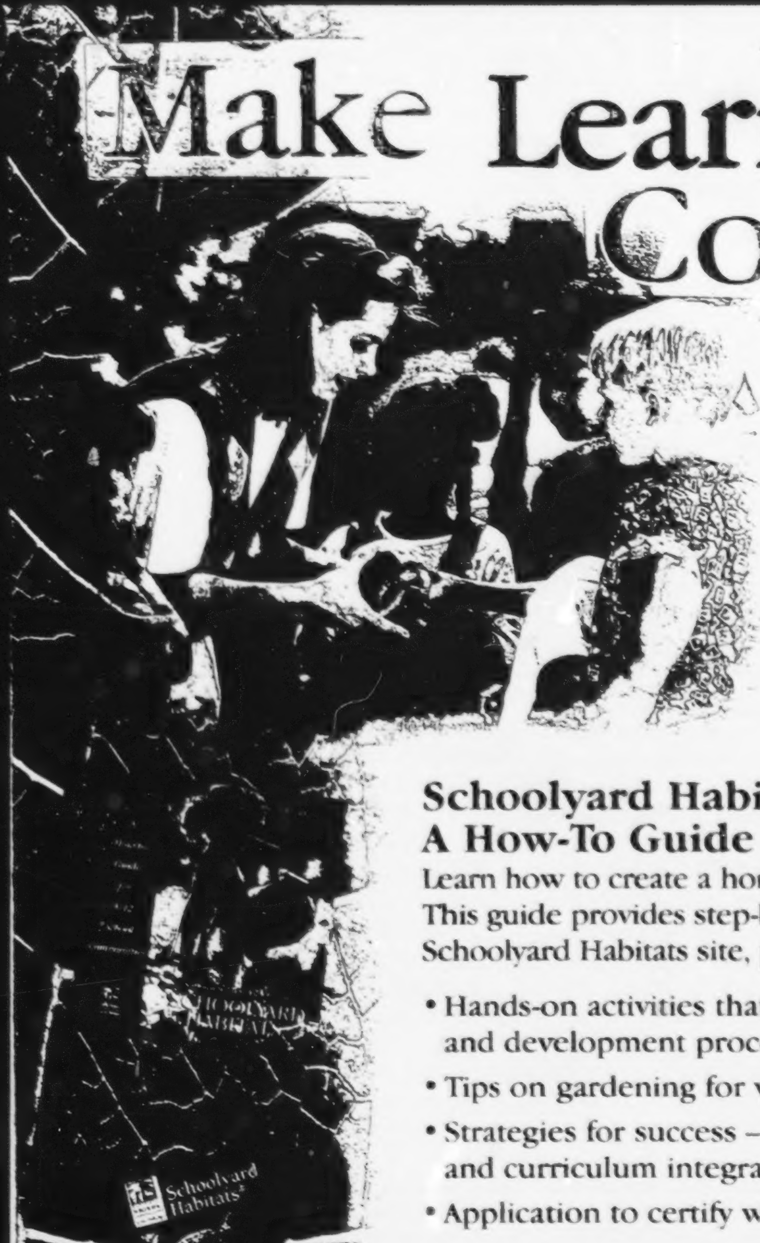
Schoolyard Habitats Program
National Wildlife Federation
11100 Wildlife Center Dr.
Reston, VA 20190-5362

NATIONAL
WILDLIFE
FEDERATION®
www.nwf.org™

Questions? Call us at 1-800-822-9919 or 703-438-6000 • World Wide Web http://www.nwf.org/habitats/schoolyard

printed with soy inks on unrebleached recycled paper with 100% post-consumer waste

Make Learning Come Alive



With Our NEW EDUCATOR RESOURCES

Schoolyard Habitats®: A How-To Guide for K-12 School Communities

Learn how to create a home for wildlife on your school grounds. This guide provides step-by-step instructions to develop and use a Schoolyard Habitats site, plus:

- Hands-on activities that engage K-12 students in the planning and development process
- Tips on gardening for wildlife
- Strategies for success – fundraising, community involvement and curriculum integration
- Application to certify with NWF

$39.95

Schoolyard Habitats® Video

See how schools across the country have turned their school grounds into homes for wildlife. Hear first-hand from teachers and students who have transformed their school grounds into certified National Wildlife Federation Schoolyard Habitats sites. Learn how easy, relevant, fun and effective a Schoolyard Habitats site can be!

$10.00

Order your new National Wildlife Federation educator resources TODAY!

2 EASY WAYS TO ORDER

Call 716-461-3092

or

click on www.nwf.org/schoolyardhabitats

NATIONAL
WILDLIFE
FEDERATION®
www.nwf.org™

BEST COPY AVAILABLE

Start Kids on a Wild Learning Adventure

With Award-Winning Magazines
From the National Wildlife Federation

BEAR
POSTER

Ranger Rick™
For Ages 7 and up
12 monthly issues
just $17

Your Big Backyard®
For Ages 3-7
12 monthly issues
just $15

Wild Anim Baby

Wild Animal Baby™
For Ages 12 months-3 yrs.
10 sturdy,
board-book style issues
just $19.95

Ranger Rick now comes with a
free online teacher's guide!

Your students will love reading Ranger Rick
and you will love using our fresh, new activities month after month.

Ranger Rick is the winner of the Education Press Association of America's Golden Lamp Award for excellence in children's publishing. The magazine is full of spectacular photos of animals in their natural habitats, intriguing facts about nature and science and fun-to-read fiction stories. The online teacher's guide contains multi-curricular activities aligned with National Standards of Learning.

Subscribe to Ranger Rick, Your Big Backyard
or Wild Animal Baby today!
Call 1-800-611-1599
(Give operator source code #P18CAN)

Retail Price $39.95

ISBN 0-945051-72-7

U.S. Department of Education
Office of Educational Research and Improvement (OERI)
National Library of Education (NLE)
Educational Resources Information Center (ERIC)

ERIC

REPRODUCTION RELEASE

I. DOCUMENT IDENTIFICATION (Class of Documents):

All Publications: Access Nature Habitats NatureScope Kit Schoolyard Habitats: A How-To Guide for K-12 Communities	
Series (Identify Series):	
Division/Department Publications (Specify):	Publication Date:

II. REPRODUCTION RELEASE:

In order to disseminate as widely as possible timely and significant materials of interest to the educational community, documents announced in the monthly abstract journal of the ERIC system, *Resources in Education* (RIE), are usually made available to users in microfiche, reproduced paper copy, and electronic media, and sold through the ERIC Document Reproduction Service (EDRS). Credit is given to the source of each document, and, if reproduction release is granted, one of the following notices is affixed to each document.

If permission is granted to reproduce and disseminate the identified documents, please CHECK ONE of the following three options and sign at the bottom of the page.

The sample sticker shown below will be affixed to all Level 1 documents	The sample sticker shown below will be affixed to all Level 2A documents	The sample sticker shown below will be affixed to all Level 2B documents
PERMISSION TO REPRODUCE AND DISSEMINATE THIS MATERIAL HAS BEEN GRANTED BY Sample TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC) 1	PERMISSION TO REPRODUCE AND DISSEMINATE THIS MATERIAL IN MICROFICHE, AND IN ELECTRONIC MEDIA FOR ERIC COLLECTION SUBSCRIBERS ONLY, HAS BEEN GRANTED BY Sample TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC) 2A	PERMISSION TO REPRODUCE AND DISSEMINATE THIS MATERIAL IN MICROFICHE ONLY HAS BEEN GRANTED BY Sample TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC) 2B
Level 1 ↑ ☐	Level 2A ↑ ☐	Level 2B ↑ ☑
Check here for Level 1 release, permitting reproduction and dissemination in microfiche or other ERIC archival media (e.g., electronic) and paper copy.	Check here for Level 2A release, permitting reproduction and dissemination in microfiche and in electronic media for ERIC archival collection subscribers only	Check here for Level 2B release, permitting reproduction and dissemination in microfiche only

Documents will be processed as indicated provided reproduction quality permits.
If permission to reproduce is granted, but no box is checked, documents will be processed at Level 1.

I hereby grant to the Educational Resources Information Center (ERIC) nonexclusive permission to reproduce and disseminate these documents as indicated above. Reproduction from the ERIC microfiche or electronic media by persons other than ERIC employees and its system contractors requires permission from the copyright holder. Exception is made for non-profit reproduction by libraries and other service agencies to satisfy information needs of educators in response to discrete inquiries.

Sign here, → please

Signature: Stephanie Stowell	Printed Name/Position/Title: Stephanie Stowell / Sr. Manager, Educator Programs	
Organization/Address: NWF 11100 Wildlife Center Drive Reston VA 20190-5362	Telephone: 703.438.6545	FAX: 703.438.6468
	E-Mail Address: Stowell@nwf.org	Date: 11/6/02

(over)

III. DOCUMENT AVAILABILITY INFORMATION (FROM NON-ERIC SOURCE):

If permission to reproduce is not granted to ERIC, or, if you wish ERIC to cite the availability of these documents from another source, please provide the following information regarding the availability of these documents. (ERIC will not announce a document unless it is publicly available, and a dependable source can be specified. Contributors should also be aware that ERIC selection criteria are significantly more stringent for documents that cannot be made available through EDRS.)

Publisher/Distributor:
National Wildlife Federation

Address:
11100 Wildlife Center Drive
Reston, VA 20190-5362
phone: 1-800-822-9919

Price:
$39.95 for each of the 3 titles listed

IV. REFERRAL OF ERIC TO COPYRIGHT/REPRODUCTION RIGHTS HOLDER:

If the right to grant this reproduction release is held by someone other than the addressee, please provide the appropriate name and address:

Name:

Address:

V. WHERE TO SEND THIS FORM:

Send this form to the following ERIC Clearinghouse:

ERIC Clearinghouse for Community Colleges
UCLA
3051 Moore Hall, Box 951521
Los Angeles, CA 90095-1521
800/832-8256
310/206-8095 fax

However, if solicited by the ERIC Facility, or if making an unsolicited contribution to ERIC, return this form (and the documents being contributed) to:

ERIC Processing and Reference Facility
4483-A Forbes Boulevard
Lanham, Maryland 20706

Telephone: 301-552-4200
Toll Free: 800-799-3742
FAX: 301-552-4700
e-mail: info@ericfac.piccard.csc.com
WWW: http://ericfacility.org

EFF-087 (Rev. 9/97)
PREVIOUS VERSIONS OF THIS FORM ARE OBSOLETE.